









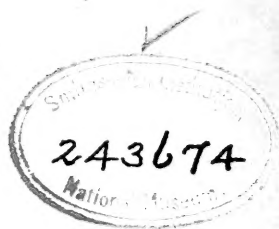
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THE ANNALS  
AND  
MAGAZINE OF NATURAL HISTORY,  
INCLUDING  
ZOOLOGY, BOTANY, AND GEOLOGY.

(BEING A CONTINUATION OF THE 'ANNALS' COMBINED WITH LOUDON AND  
CHARLESWORTH'S 'MAGAZINE OF NATURAL HISTORY.')

CONDUCTED BY  
WILLIAM CARRUTHERS, Ph.D., F.R.S., F.L.S., F.G.S.,  
ARTHUR E. SHIPLEY, M.A., Sc.D., F.R.S., F.Z.S.,  
AND  
RICHARD T. FRANCIS, F.Z.S.

VOL. I.—NINTH SERIES.



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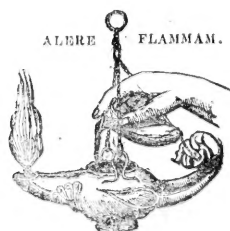
1918.

"Omnes res creatæ sunt divinæ sapientiæ et potentiæ testes, divitiæ felicitatis humanæ:—ex harum usu *bonitas* Creatoris; ex pulchritudine *sapientia* Domini; ex œconomiâ in conservatione, proportione, renovatione, *potentia* majestatis elucet. Earum itaque indagatio ab hominibus sibi relictis semper æstimata; à verè eruditis et sapientibus semper exulta; malè doctis et barbaris semper inimica fuit."—LINNÆUS.

"Quel que soit le principe de la vie animale, il ne faut qu'ouvrir les yeux pour voir qu'elle est le chef-d'œuvre de la Toute-puissance, et le but auquel se rapportent toutes ses opérations."—BRÜCKNER, *Théorie du Système Animal*, Leyden, 1767.

. . . . . The sylvan powers  
Obey our summons; from their deepest dells  
The Dryads come, and throw their garlands wild  
And odorous branches at our feet; the Nymphs  
That press with nimble step the mountain-thyme  
And purple heath-flower come not empty-handed,  
But scatter round ten thousand forms minute  
Of velvet moss or lichen, torn from rock  
Or rifted oak or cavern deep: the Naiads too  
Quit their loved native stream, from whose smooth face  
They crop the lily, and each sedge and rush  
That drinks the rippling tide: the frozen poles,  
Where peril waits the bold adventurer's tread,  
The burning sands of Borneo and Cayenne,  
All, all to us unlock their secret stores  
And pay their cheerful tribute.

J. TAYLOR, *Norwich*, 1818.



# CONTENTS OF VOL. I.

## [NINTH SERIES.]

### NUMBER 1.

	Page
I. On new African <i>Curculionidæ</i> .—I. By GUY A. K. MARSHALL, D.Sc. (Plate I.).....	1
II. Bermudian Species of <i>Donatia</i> ( <i>Tethya</i> ). By BLANCHE BENJAMIN CROZIER .....	11
III. New Lepidoptera in the Joicey Collection. By L. B. PROUT, F.E.S. ....	18
IV. On the Striped Squirrels hitherto referred to the Genus <i>Paraxerus</i> . By OLDFIELD THOMAS .....	33
V. Two new Tucu-tucos from Argentina. By OLDFIELD THOMAS. ....	38
VI. <i>Protoëchimus</i> , Austin. By F. A. BATHER, D.Sc., F.R.S. (Plate II.) .....	40
VII. Notes on the <i>Braconidæ</i> in the British Museum.—II. On the Australian Species of <i>Cardiochilinae</i> and <i>Doryctinae</i> . By ROWLAND E. TURNER, F.Z.S., F.E.S.....	49
VIII. Further Notes on the <i>Asilidæ</i> of Australia. By GERTRUDE RICARDO .....	57



	Page
IX. Note on the Lower Jaw of <i>Stereognathus ooliticus</i> , Charlesworth. By Dr. BRANISLAV PETRONIEVICS. (Plate III.)	67
X. Variation in the Prothoracic Spines of <i>Dactylispa xanthopus</i> , Gestro. By S. MAULIK, B.A. (Cantab.), F.E.S.	70
XI. Note on <i>Epistictia reicheana</i> , Guérin. By S. A. MAULIK, B.A. (Cantab.), F.E.S.	74
XII. New Species and Races of <i>Ithomiinae</i> in the Joicey Collection. By W. J. KAYE, F.E.S.	77
XIII. Notes on Fossorial Hymenoptera. — XXXII. On new Species in the British Museum. By ROWLAND E. TURNER, F.Z.S., F.E.S.	86
XIV. On Barnacles of the Genus <i>Scalpellum</i> from Deep-sea Telegraph-Cables. By W. T. CALMAN, D.Sc.	96
XV. Descriptions of New <i>Pyrallidæ</i> of the Subfamily <i>Pyraustinae</i> . By Sir GEORGE F. HAMPSON, Bart., F.Z.S., &c.	125

## NUMBER 2.

XVI. Descriptions of Thirty-four Species of Marine Mollusca from the Persian Gulf, Gulf of Oman, and Arabian Sea, collected by Mr. F. W. Townsend. By JAMES COSMO MELVILL, M.A., D.Sc. (Plates IV. & V.)	137
XVII. Descriptions and Records of Bees.—LXXIX. By T. D. A. COCKERELL, University of Colorado	158
XVIII. The Coleoptera of the Falkland Islands. By G. C. CHAMPION, F.Z.S.	167
XIX. On small Mammals from Salta and Jujuy collected by Mr. E. Budin. By OLDFIELD THOMAS	186
XX. The Generic Division of the Hedgehogs. By OLDFIELD THOMAS	193
XXI. The Homoptera of Indo-China. By W. L. DISTANT	196

## NUMBER 3.

	Page
XXII. Brief Descriptions of new Thysanoptera.—IX. By RICHARD S. BAGNALL, F.L.S. ....	201
XXIII. Notes on the <i>Braconidæ</i> in the British Museum.—III. On new Australian <i>Agathinæ</i> . By ROWLAND E. TURNER, F.Z.S., F.E.S. ....	221
XXIV. Four new Species of Hedgehog. By OLDFIELD THOMAS. ....	230
XXV. A new River-crab from the Transvaal. By W. T. CALMAN, D.Sc. ....	234
XXVI. On the Papuan, Melanesian, and North Australian Species of the Genus <i>Rana</i> . By G. A. BOULENGER, F.R.S. ....	236
XXVII. Some Notes on the small Sand-Foxes of North Africa. By OLDFIELD THOMAS ....	242
XXVIII. <i>Platymycterus</i> , a new Genus of Asiatic <i>Curculionidæ</i> (Coleopt.). By GUY A. K. MARSHALL, D.Sc. ....	245
XXIX. Descriptions of New <i>Pyralidæ</i> of the Subfamily <i>Pyraustinæ</i> . By Sir GEORGE F. HAMPSON, Bart., F.Z.S., &c. ....	252
Proceedings of the Geological Society .....	262

## NUMBER 4.

XXX. Descriptions of New <i>Pyralidæ</i> of the Subfamily <i>Pyraustinæ</i> . By Sir GEORGE F. HAMPSON, Bart., F.Z.S., &c. ....	265
XXXI. A peculiar State of Development in <i>Brachydesmus</i> (Myriapoda—Polydesmoidea). By HENRY W. BRÖLEMANN (of Pau, Basses-Pyrénées, France) .....	281
XXXII. Notes on Fossorial Hymenoptera.—XXXIII. On new Ethiopian Species of <i>Psammocharidæ</i> . By ROWLAND E. TURNER, F.Z.S., F.E.S. ....	284
XXXIII. The Homologies of the Anal Plate in <i>Antedon</i> . By F. A. BATHER, D.Sc., F.R.S. ....	294
XXXIV. On the Arrangement of the small <i>Tenrecidæ</i> hitherto referred to <i>Oryzorictes</i> and <i>Microgale</i> . By OLDFIELD THOMAS ....	302

	Page
XXXV. The Baculum or Os Penis of some Genera of <i>Mustelidæ</i> . By R. I. Pocock, F.R.S. ....	307
XXXVI. New Heterocera in the Joicey Collection. By Louis B. Prout, F.E.S. ....	312
XXXVII. Note on <i>Lacoptera vigintisex-notata</i> , Boheman. By S. MAULIK, B.A. Cantab., F.E.S., F.Z.S. ....	318
XXXVIII. Two new Indian <i>Cassidinæ</i> Beetles. By S. MAULIK, B.A. Cantab., F.E.S. ....	322
XXXIX. On a new Genus and Two new Species of <i>Amatidæ</i> ( <i>Syntomidæ</i> ) in the Joicey Collection. By W. J. KAYE, F.E.S. ..	325
<i>New Book</i> :—Shells as Evidences of the Migrations of Early Culture. By J. WILFRED JACKSON .....	327

## NUMBER 5.

XL. Notes on Exotic <i>Chloropidæ</i> .—Part II. <i>Oscininæ</i> . By C. G. LAMB, M.A., B.Sc., Clare College, Cambridge .....	329
XLI. Notes on Fossorial Hymenoptera.—XXXIV. On Ethiopian <i>Psammocharidæ</i> in the British Museum. By ROWLAND E. TURNER, F.Z.S., F.E.S. ....	349
XLII. Notes on Fossorial Hymenoptera.—XXXV. On new <i>Sphe- coidea</i> in the British Museum. By ROWLAND E. TURNER, F.Z.S., F.E.S. ....	356
XLIII. Notes on <i>Petrodromus</i> and <i>Rhynchocyon</i> . By OLDFIELD THOMAS .....	364
XLIV. A new Wild Dog from the Bogotá Cordillera. By OLD- FIELD THOMAS .....	370
XLV. Remarks on the Batrachian Genera <i>Cornufer</i> , <i>Tschudi</i> , <i>Platymantis</i> , Gthr., <i>Simomantis</i> , g. n., and <i>Staurois</i> , Cope. By G. A. BOULENGER, F.R.S. ....	372
XLVI. Further Notes on some External Characters of the Bears ( <i>Ursidæ</i> ). By R. I. Pocock, F.R.S. ....	375

## NUMBER 6.

Page

XLVII. Notes on Exotic <i>Chloropidae</i> .—Part II. <i>Osciniæ</i> . By C. G. LAMB, M.A., B.Sc., Clare College, Cambridge .....	385
XLVIII. On the Origin and Affinities of the Acari of the Family <i>Demodecidae</i> , with Brief Remarks on the Morphology of the Group. By STANLEY HIRST .....	400
XLIX. The Type-specimens of <i>Pæcilasma carinatum</i> , Hoek (Cirripedia). By W. T. CALMAN, D.Sc. ....	401
L. On new Hymenoptera of the Family <i>Evanitidæ</i> in the British Museum. By ROWLAND E. TURNER, F.Z.S., F.E.S. ....	408
LI. Contributions to a further Knowledge of the Rhynchotal Family <i>Lygæidæ</i> . By W. L. DISTANT .....	416
LII. Two new Diptera from Trinidad. By F. W. EDWARDS ..	424
LIII. On some External Characters of Ruminant Artiodactyla.— Part I.—The <i>Cephalophinæ</i> , <i>Neotraginæ</i> , <i>Oreotraginæ</i> , and <i>Mado- quinæ</i> . By R. I. POCKOCK, F.R.S. ....	426
Proceedings of the Geological Society .....	435
Index .....	437

PLATES IN VOL. I.

- PLATE I. *Sphrigodes gunni*, *Deiradognathus fasciatus*, and *Cylindrobaris ornata*.  
II. *Protoechinus anceps*.  
III. Portions of lower jaw of *Stereognathus ooliticus*.  
IV. } Mollusca from Persian Gulf and Arabian Sea.  
V. }
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ERRATUM.

Page 157, line 4, and page 158, line 37, for *Cypricardia* read *Venerupis*.



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WITH THREE PLATES.

Illustrative of Dr. G. A. K. Marshall's Paper on new African *Circulionidae*,  
Dr. F. A. Bather's on *Protoechinus*, Austin, and Dr. B. Petronievics's on the  
Lower Jaw of *Stereognathus ooliticus*.

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[NINTH SERIES.]

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"..... per litora spargite muscum,  
Naiades, et circum vitreos considite fontes:  
Pollice virgineo teneros hic carpite flores:  
Floribus et pictum, divæ, replete canistrum.  
At vos, o Nymphæ Craterides, ite sub undas;  
Ite, recurvato variata corallia trunco  
Vellite muscosis e rupibus, et mihi conchas  
Ferte, Deæ pelagi, et pingui conchylia succo."  
*N. Parthenii Giannettasi, Eol. 1.*

---

No. 1. JANUARY 1918.

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I.—*On new African Curculionidæ.*—I.  
By GUY A. K. MARSHALL, D.Sc.

[Plate I.]

Subfamily *BRACHYDERINÆ*.

*Sympiezomias cupreovirens*, sp. n.

♂ ♀. Colour black, with dense bright green scaling above and a narrow coppery stripe running from the front margin of the prothorax to the apex of the elytra; on the prothorax there is sometimes a faint trace of a lateral stripe which is continued on to the base of the elytra; in some cases the upper surface is coppery, with a narrow lateral green stripe on both prothorax and elytra; the lower surface in either case rather brassy.

*Head* with very sparse shallow punctures which are quite hidden by the scaling, the forehead with a faint central stria continuous with the rostral furrow. *Rostrum* a little longer than its basal width, parallel-sided, the dorsal outline rather strongly curved; the upper surface almost flat transversely, with a deep narrow central furrow in the basal half and a broader shallower lateral one on each side flanked internally by a low carina; below and parallel with this a short furrow in front of the eye. *Antennæ* piceous; joint 1 of the funicle

as long as 2+3+4; joint 2 about as long as broad, the remainder transverse. *Prothorax* slightly broader than long, the apex much narrower than the base, the sides moderately rounded, broadest about the middle, the apical constriction shallow; the upper surface with very shallow and sparse punctation, which is entirely hidden, and a deep narrow central furrow that does not quite reach either the apex or base. *Elytra* narrowly subelliptical, broadest about the middle, the apices jointly rounded in both sexes, distinctly more pointed behind in the ♀ and with the extreme tip produced slightly downwards; the shallow striæ appear extremely narrow when the scaling is intact, and the punctures are almost hidden; the intervals are flat, dull, and finely rugulose beneath the scaling, each bearing a single row of very short and inconspicuous recumbent scale-like setæ. *Legs* piceous, with the tibiæ and tarsi more reddish.

Length 5-6, breadth 2 mm.

NATAL: Vlakhoek (*H. J. Stiebel*—type). TRANSVAAL: Johannesburg (*Harold A. Fry*).

The Natal specimens were forwarded by the Division of Entomology, Pretoria, with the information that the insects were destroying young leaves on apple-trees.

Very closely allied to *S. (Piazomias) viridanus*, Fhs., which occurs also in the Transvaal; but that species differs in having the prothorax a little longer (at least as long as broad), only slightly narrower at the apex than at the base, and with the surface rugosely sculptured in longitudinal wrinkles; the head is granulose (beneath the scaling) and somewhat striolate on the forehead, the eyes being distinctly shorter and more convex; the rostrum is proportionately broader, slightly widened at the genæ, and with the dorsal outline almost straight; the teeth on the inner edge of the tibiæ are shorter and more slender, &c.

The genus *Sympiezomias*, Fst., has not been previously recorded from Africa, but there seems to be no reason for separating these two insects from the Indian species, despite the difference in the structure of the scales, all of which have a small boss-like elevation in the middle, like those of the Indian genera *Lepidospyris*, Mshl., and *Tylopholis*, Mshl.

#### Subfamily OTIORRHYNCHINÆ.

##### Genus SPHRIGODES, Gerst.

##### *Sphrigodes gunni*, sp. n.

♂. Colour black, with dense dark brown scaling above, variegated with stripes and spots of whitish scales, the lower

surface with uniform pale greenish scaling. The head with pale scales round the eyes and along the dorsal edges of the rostrum; the prothorax with five narrow pale longitudinal stripes; the elytra with the following pale markings:—on interval 2 a stripe running from near the base to a little beyond the middle; interval 4 with a stripe from the base as far as the middle of that on int. 2; int. 6 with a spot close to the base and another before the middle; int. 8 with a broad stripe from the base to beyond the middle, and on a level with the end of this starts an oblique row of longitudinal patches along the top of the declivity on ints. 7, 6, 4, and 2 respectively, that on 6 being usually the longest; a narrower stripe on the apical part of int. 8, which bends round in the form of a hook on to the apex of int. 4; and, finally, a V-shaped mark at the extreme apex on ints. 2 and 10.

*Head* with the coarse close punctation hidden by the scaling; the forehead flat, with an elongate central fovea. *Rostrum* not much longer than its width at the genæ, parallel-sided in the basal half, then abruptly and strongly dilated; the dorsal area flat behind and shallowly impressed in front, its margins subcarinate and the lateral areas on each side almost perpendicular; the greatest distance between the scrobes about equal to the width of the forehead. *Antennæ* with the scape extending well beyond the front margin of the prothorax; the two basal joints of the funicle equal, joints 3 to 5 gradually diminishing in length, and 5 to 7 subequal and slightly longer than broad. *Prothorax* broader than long, broadest near the base, the sides moderately rounded, the apical constriction shallow but distinct; the upper surface evenly convex, without any furrow, and set with close reticulate punctures, each of which is filled with a flat subcircular scale, the narrow shiny interspaces being mostly uncovered. *Elytra* broadly ovate, their greatest width not far from the base, the dorsal outline moderately convex, the posterior declivity very steep; the upper surface with shallow striæ containing rows of deep distant punctures, each of which bears a curved seta that does not rise above the rim of the puncture; the intervals between the striæ broad and flat, closely covered with subcircular convex scales which do not overlap, and between which the shiny integument is often visible; the short curved scale-like setæ are irregularly scattered, and agree in colour with the scales around them. *Legs* with moderately close pale greenish scaling; the hind tibiæ curved so that the upper edge is concave and the lower



convex, and near the apex of the lower edge is an impressed bare area, above which are two very stout bifid spines and some simple spines above them; the other tibiæ have each in the same position a row of three or four simple spines.

Length  $4\frac{1}{2}$ –5, breadth  $2\frac{1}{2}$ –3 mm.

♀. The scaling of the upper surface light grey-brown or brownish grey, the markings that are so conspicuous in the ♂ being only faintly indicated owing to their being very little lighter than the ground-colour.

The only structural differences are that the prothorax is proportionally broader, the apices of the elytra are jointly produced downwards into a beak-like point, and the last ventral segment is pointed at the apex and strongly compressed at the sides so as to form a prominent median ridge. In the ♂ this ventral segment is only slightly convex, broadly rounded at the apex, and bears a small shallow apical impression.

Length  $5\frac{1}{2}$ –6, breadth 3– $3\frac{1}{4}$  mm.

TRANSVAAL: Pretoria (*D. Gunn*).

The male specimens were found on *Acacia cafra* and the females on grass.

This insect would have been referred by Faust to the genus *Embrithes*, Schh., and is congeneric with his *E. plagiatus* and *E. miser* from East Africa. These insects are unquestionably referable to *Sphrigodes*, Gerst., and it is therefore probable that all the other tropical species of *Embrithes* described by Faust should be assigned to that genus.

In the true *Embrithes*, which are confined to the Cape subregion, the scape does not extend beyond the front margin of the prothorax; the rostrum is short and broad, being no longer than its basal width; the surface of the prothorax is uneven, and the upper edge of its basal margin is not carinate.

In *Sphrigodes* the scape extends well beyond the front margin of the prothorax; the rostrum is much longer than its basal width; the surface of the prothorax is smooth, and the upper edge of its basal margin is finely carinate.

#### Subfamily CRYPTORRHYNCHINÆ.

#### Genus DEIRADOGNATHUS, nov.

*Head* almost concealed from above in repose; the eyes large, narrowed below, the space between them above slightly greater than, and beneath less than, the basal width

of the rostrum. *Rostrum* bent before the middle, the apical half flattened dorso-ventrally, with a deep constriction just in front of the eyes; the scrobes beginning at the middle and not passing actually beneath the rostrum at the base, so that the lower edge of the rostrum (when viewed from the side) is visible beneath the lower margin of the scrobe throughout; the mandibles triangular in cross-section, the outer surface angulate, forming a longitudinal ridge, the cutting-edge shallowly bisinuate. *Antennæ* with the scape not reaching the eye, the two basal joints of the funicle equal, the third only slightly shorter than the second; the club broadly ovate, as long as the two preceding joints, segmented, the margins of the segments almost transverse. *Scutellum* distinct. *Elytra* broader than the thorax, with prominent shoulders and ten striæ. *Legs* moderate, the front pair about as long as the hind; the femora gradually dilated, with a stout tooth, not furrowed beneath, the hind pair not reaching the apex of the elytra; the tibiæ compressed, strongly bent at the base, the lower edge shallowly bisinuate, the upper surface forming a sharp edge, the apex strongly uncinatè, the corbels of the hind pair open; the tarsal claws simple, stout and free. *Sternum* with a deep prosternal furrow, which is not continued on to the mesosternum, the front coxæ being as widely separated as the mid pair and having a rather prominent internal apical angle; the mesepimeron nearly twice the size of the mesepisternum, the intercoxal process lying much below the level of the mid coxæ, and the front margin of the cavity of these coxæ bearing a distinct short projection; the metasternum between the coxæ more than  $1\frac{1}{2}$  times as long as the mid coxæ. *Venter* with segment 2 longer than either 3 or 4, but shorter than the two together, the portion of segment 1 behind the coxa distinctly longer than segment 2, the hind margin of segment 1 straight, the intercoxal process comparatively narrow and conical.

TYPE, *Deiradognathus fasciatus*, sp. n.

This genus falls into Lacordaire's group *Ithyporides*, and in Faust's key to the African genera known to him (Stett. Ent. Zeit. 1893, p. 232) it runs down next to *Haplocorynus*, Fst., which differs in having the femora abruptly clavate and the hind pair extending beyond the apex of the elytra, the second joint of the funicle longer than the first, and the portion of the first ventral segment behind the coxæ shorter than the second segment.

It is also allied to the Eastern *Colobodes*, Schh.; but in this genus segment 2 is as long as 3+4, the femora have a

furrow beneath from the apex to the tooth, the mandibles are rounded externally, the scrobes pass beneath the rostrum in the basal third, and the margins of the joints of the antennal club are very oblique.

*Deiradognathus fasciatus*, sp. n.

♀. Colour black, partly clothed with dense brownish cream-coloured scaling, and elsewhere with leaden-grey scales variegated with blackish brown. The head creamy with brown markings; the entire prothorax creamy, except a large dorsal hexagonal dark brown patch in the centre of the basal half; the elytra with dark scaling, except for a small spot at the base of interval 6 and a broad irregular transverse creamy band behind the middle, which widens outwardly from the suture to the lateral margin and extends along the margin to the base, being almost interrupted near the suture by an oblique leaden-grey patch on intervals 2 and 3; the dark parts of the elytra are leaden grey, with a slight sheen, variegated with velvety dark brown or blackish patches, especially on the elevations; the lower surface is creamy, except the last three ventral segments, which are dark with a row of pale spots down the middle and on each side; the legs creamy with large dark brown patches, the apices of the femora and the lower surface of the tarsi reddish brown.

*Head* dull, with fine and very shallow reticulation and scattered large deep punctures, but the sculpture is entirely hidden by the erect scales, which are so densely packed that only the tips are visible. *Rostrum* convex and almost parallel-sided in the basal third, thence flattened and markedly widening to the apex; in the basal area the punctation is very coarse and confluent at the sides, where the scaling is dense, and the dorsal area bears separated punctures of varying sizes; the flattened anterior part is much more sparsely punctate, and there is an undefined impunctate central stripe. *Prothorax* almost as long as its greatest width, the sides very strongly rounded, broadest before the middle, the base bisinuate and broader than the apex, which is somewhat produced over the head and subtruncate in the middle; across the widest part there is a transverse row of four conical prominences and two others near the front margin, all of which appear to be due to elevations of the integument, but are really produced by bunches of convergent upright scales; the integument itself, which is completely hidden, bears coarse separated

punctures, with the intervals minutely sculptured, and there is a well-marked central carina (visible through the scaling) running from the base for two-thirds of the length. *Scutellum* bearing in front an erect compressed prominence, which is rendered less noticeable by the fact that the rest of the surface is covered by a cushion of erect red-brown scales of the same height. *Elytra* jointly sinuate at the base, very gradually narrowed behind from the shoulders, which are almost right angles, with a deep oblique impression before the apices, which are separated, each bearing a small tubercle; the upper surface with regular rows of large shallow punctures, which are more or less concealed by the scaling, the intervals 1, 3, 5, and 7 slightly more raised; interval 3 with a large boss-like patch of raised scales near the base, a long one close behind it which just reaches the pale band, a rounded one at the hind edge of the band, and a row of much smaller ones from there to the apex; interval 5 with similar but smaller raised patches on a level with the two front ones on 3, a small one in the pale band in front of that on 3, and a large dark boss-like one on the declivity; a row of variable and often indistinct small prominences on interval 7 and on the declivity only of interval 1.

Length 12-14, width 5-5½ mm.

S. RHODESIA: Bulawayo (*F. Eyles*).

*Mecistocerus aloes*, sp. n.

♂ ♀. Colour black, with fairly dense dark brown scaling, irregularly and indefinitely variegated on the elytra with paler scales; the legs greyish brown, all the tibiæ having a dark band in the basal half, and the hind femora with a large dark patch about the middle.

*Head* with coarse confluent punctation, each puncture being filled with a broad scale; the forehead without a central furrow. *Rostrum*—(♂) rather coarsely and confluent punctate throughout, with a sharp central carina in the basal half and on each side a broad shallow lateral furrow, which almost reaches the apex, but becomes broader and indefinite in the basal third, and below this in the apical half another shallow punctate furrow, which forms a continuation of the scrobe almost to the apex; (♀) coarsely punctate only at the sides of the basal third, the remainder shiny and with fine scattered punctures, without any central carina, and the upper lateral furrow deeper and more sharply defined than in the ♂. *Antennæ* piceous;

inserted at the middle of the rostrum ( $\delta$ ) or slightly behind it ( $\eta$ ); the scape as long as the first  $3\frac{1}{2}$  joints of the funicle; and the club narrowly elliptical and distinctly longer than the last three joints, which are slightly transverse; joint 2 of the funicle much longer than 1. *Prothorax* as long as broad, shallowly bisinuate at the base, the sides subparallel or slightly diverging from the base to beyond the middle and converging strongly in front; the upper surface with very deeply reticulate punctures throughout and without any definite central carina; the deep honeycomb-like punctures are usually filled with extraneous matter, but each contains to one side a curved scale-like seta, the pale ones, which are arranged roughly in three longitudinal stripes, being much broader than the dark ones. *Elytra* much broader than the prothorax, the shoulders roundly rectangular; the striae deeply punctate, the divisions between the punctures more or less granuliform, the intervals flat, about as broad as the striae and set with irregular low granules, which are not visible when the scaling is intact; the scales ovate, dense, and overlapping. *Legs* with the femora almost linear, the hind pair reaching only the middle of the last ventral segment. *Venter* with the hind margin of the first segment shallowly bisinuate.

Length  $7\frac{1}{2}$ – $8\frac{1}{2}$ , breadth  $3$ – $3\frac{1}{2}$  mm.

TRANSVAAL: Pretoria.

Mr. Claude Fuller, Division of Entomology, Pretoria, states that these weevils were found puncturing the leaves of aloe plants.

On account of its linear femora this species falls into the subgenus *Rhadinomerus*, Fst. (cf. Heller, Ent. Tidsk. 1904, p. 186), from the previously described species of which it differs in having two lateral furrows on each side of the anterior half of the rostrum.

#### Subfamily BARIDINÆ.

#### Genus CYLINDROBARIS, nov.

*Rostrum* as long as the prothorax, gibbous at the base and tapering strongly to the apex, with the antennae inserted a little before the middle, and separated from the head by a deep transverse impression; the scrobes uniting beneath the rostrum; the mandibles strongly bidentate. *Antennae* with the scape straight, broadly clavate, and not reaching the eye; the funicle with the two basal joints longer, 3–7 transverse and gradually widening outwardly, the



seventh free; the first joint of the club as long as the rest together. *Prothorax* as long as broad, very shallowly bisinuate at the base, and with a very slight post-ocular lobe. *Scutellum* large, oblong, and transverse. *Elytra* elongate, subcylindrical, with ten striæ, separately rounded at the apex and leaving the sloping pygidium exposed; the shoulders prominent. *Legs* moderately long; the femora not toothed and but little dilated, the posterior pairs almost linear and not furrowed beneath; the tibiæ strongly bent near the base, otherwise straight, not furrowed, and mucronate at the apex; the tarsal claws rather small and connate at the base. *Sternum*: the prosternum (and still more the mesosternum) well below the level of the metasternum, not furrowed in front of the coxæ; the front and mid coxæ equally separated, the interspace being narrow, not broader than the front tibiæ; the mesosternum with the side-pieces sharply differentiated; the metasternum elongate, the length between the coxæ nearly twice as long as the mid coxæ, the episternum correspondingly long and comparatively narrow. *Venter* with the intercoxal piece rounded and comparatively narrow, not broader than the hind coxa; the length of segment 1 behind the coxa slightly greater than that of 2, the suture between them obliterated in the middle, segment 2 as long as 3+4, the hind margins of all three almost straight and only slightly angulate at the sides; the tergites strongly chitinated and coarsely punctate.

TYPE, *Cylindrobaris ornata*, sp. n.

The large size and elongate cylindrical shape of this insect give it an aspect which is hardly suggestive of a Barid, the form being very similar to that of the Calandrid genus *Cyrtorrhinus*, Lac. The close approximation of the mid coxæ, the tapering rostrum, and the almost straight margins of the intermediate ventral segments are all somewhat unusual characters among the true *Barides*, to which the genus belongs.

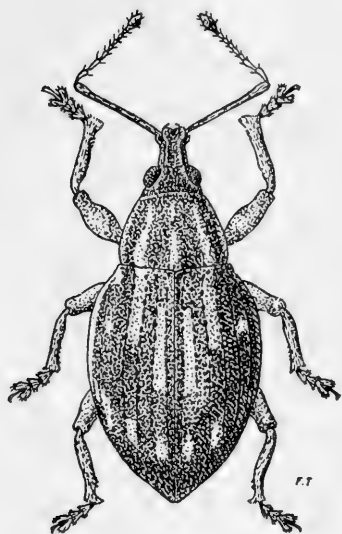
*Cylindrobaris ornata*, sp. n.

General colour black or brownish black, with the head, rostrum, antennæ, legs, apex of venter, and the last four or five abdominal tergites red-brown; occasionally the whole insect is red-brown. The body is decorated with the following markings, formed of dense overlapping lemon-yellow scales:—the whole of the scutellum; a transverse patch near the base of the elytra between striæ 2 and 5, another similar one a little behind it between striæ 6 and 9,

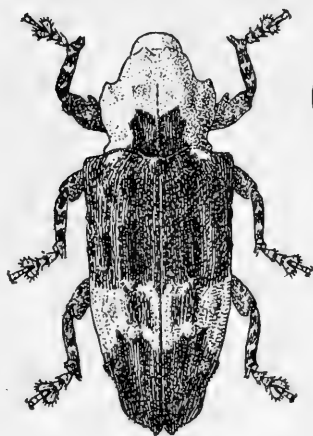
and a broad transverse band at two-thirds from the base extending from stria 1 to 9; a broad stripe down the middle of the prosternum and mesosternum and partly invading the coxæ, the whole of the mesepimeron, a spot at the base of the metepisternum, a small patch at each apical external angle of the metasternum, and a large transverse patch on each side of the first ventral segment.

♂ ♀. *Head* bare, aciculate, with shallow separated punctures. *Rostrum* sharply bent downwards near the base, and from there nearly straight to the apex, without carinæ or sulci, coarsely and confluent punctate from the base to the end of the scrobe, the punctures being very much larger on the sides of the deep compressed basal area and each containing a short linear scale-like seta, the apical area much more finely and sparsely punctate. *Antennæ* with the club of the scape shallowly excavated on its lower face, the side that fits into the scrobe protected by a patch of stiff scale-like bristles; the funicle with joint 1 a little longer than 2, joint 3 quadrate. *Prothorax* very slightly widened from the base to the middle, and there rather abruptly and strongly narrowed to the apex, but without any distinct apical constriction, the front margin truncate dorsally, the dorsal outline rather strongly convex longitudinally and deepest a little behind the middle; the upper surface uniformly and closely covered with fine wavy ridges, which converge obliquely towards the front margin in the anterior half and in the hinder half form roughly concentric curves round the highest point; lying transversely to the ridges are numerous short linear scale-like white setæ. *Elytra* elongate, with the sides shallowly sinuate in the middle, separately rounded at the base, and a little broader than the prothorax at the shoulders, which are obtusely prominent; the upper surface moderately shiny and devoid of scaling (except for the markings described above), with regular deep punctate striæ, of which the 7th and 8th begin only at about one-fourth from the base, and the 10th is broadly interrupted in the middle; the intervals broad and flat, bearing numerous transverse cuts or excisions, each of which contains a short recumbent dark seta, and interval 3 markedly broader at the base than the adjoining ones; the punctures in the striæ contain very short setæ which do not rise above the edges of the stria. *Legs* set with coarse punctures (rounded on the femora and elongate on the tibiæ) bearing white scale-like setæ.

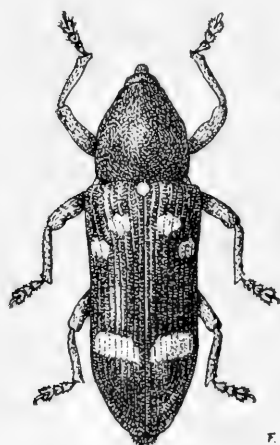
Length 7-9, breadth  $2\frac{1}{2}$ -3 mm.



*Sphrigodes gunni*, Mshl.  $\times 9$ .



*Deiradognathus fasciatus*, Mshl.  $\times 4$ .



*Cylindrobaris ornata*, Mshl.  $\times 5$ .



NYASALAND : Mt. Mlanje (*S. A. Neave*—type). S. RHODESIA : Sebakwe (*D. Dodds*). TRANSVAAL : Pretoria.

EXPLANATION OF PLATE I.

*Sphrigodes gunni*, Marshall,  $\times 9$ .

*Deiradognathus fasciatus*, Marshall,  $\times 4$ .

*Cylindrobatis ornata*, Marshall,  $\times 5$ .

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II.—*Bermudian Species of Donatia* (Tethya).

By BLANCHE BENJAMIN CROZIER.

(*Contributions from the Bermuda Biological Station for Research*.—No. 77.)

A SEARCH for budding sponges in the waters about Bermuda has revealed, in addition to members of other genera, three species of *Donatia*—*D. lyncurium*, *D. seychellensis*, and two varieties of *D. ingalli*. All, with the exception of *D. lyncurium*, which is comparatively rare, have been obtained in great abundance throughout their respective budding seasons, and kept under observation in their natural situations from September 1st to the end of May. These observations were made as a preliminary to a study, now in progress, of the germ cells of these sponges. I have enjoyed the use of certain equipment belonging to the Bermuda Biological Station, and from the Resident Naturalist of the Station, Dr. W. J. Crozier, I have constantly received assistance. To the Smithsonian Institution I am indebted for the loan of a collection of identified material.

I. *Donatia seychellensis* (E. P. Wright).

During the first week in September *Donatia seychellensis*, in moderate numbers, was found attached to the vegetation in Millbrook and Fairyland Creeks. These creeks are long narrow inlets bordered by mangroves. They are very shallow, and a large part of the bottom is covered with plants, flat-bladed "eel-grass" or turtle-grass, round-bladed grass, and algæ. The sponge attaches itself to the grass by rather slender anchoring filaments; in its most common position upon a round blade it sends out two principal filaments in opposite directions along the length of the blade, and from its base a few tiny hairs straight toward the blade. It may

also send out two or three filaments to neighbouring blades. Less commonly the attachment is to the flat-bladed grass or to algæ.

These sponges are of an orange colour, with no great variation from the lighter yellowish or greenish orange to the deeper reddish hue. The lighter colour is more common in small individuals, the deeper colour in large ones. Specimens preserved in alcohol are dull light brown. They are approximately spherical and from 8 to 20 mm. in diameter. The surface of a fresh specimen is divided up into polygonal denticulated areas deeper in colour and denser in texture than the intervening spaces, though not necessarily raised above them; and from the denticulations of these areas proceed strands, which form a close network in the spaces. In the lighter coloured specimens green shows through this network. The polygonal areas, or conules, occur all over the animal, though they vary greatly in shape even in any one specimen. They may be irregular polygons or nearly round; they may be flat or raised in the centre into a hillock with or without a spine projecting from its centre: at intervals the place of a conule is occupied by a smooth round swelling of the size of a bud but without a stalk; or the position may be occupied by a bud with a long or short stalk. A bud may come from only one conule or, less frequently, it may have two or three stalks from adjacent conules. The polygonal areas about the osculum are modified into long plates, but these do not stand up above the general surface, so that the osculum is not conspicuous unless open. It leads into a chamber into which a number of canals open. Its position bears no constant relation to the region of attachment of the sponge.

A typical full-grown bud is spherical or egg-shaped, 2 to 5 mm. in diameter, and of a bright clear orange colour. It is borne on a stalk varying in length from less than 1 mm. to several times the diameter of the bud. This stalk often continues through the bud and projects on the distal side as a slender spine or hair, usually with a small swelling at its end. From the sides of the bud grow numerous shorter spines, often with swellings at their free ends. If sponges bearing buds are kept in a jar with running water for a few days, the stalks elongate and finally the buds drop off and settle to the bottom, while the parent sponges send out numerous very long slender spines, which attach to the sides of the jar or to other individuals. In order to give some idea of the time required for bud formation, a specimen without buds was placed under observation in a jar of running water on Sept. 4. The polygonal areas at this time were not

raised above the general surface. On Sept. 5 they were projecting slightly. On Sept. 6 many of these elevations formed the ends of buds whose connexion with the parent sponge gradually narrowed to a slender stalk. Spines appeared from the sides and ends of the buds. On Sept. 7 the first bud dropped off.

If a fresh specimen of average size, *i. e.* about 15 mm. in diameter, be cut in two, it is seen to have a well-defined cortex 1.5 mm. thick, consisting of a thin tough inner layer of white fibrous material and a thick fleshy outer layer orange in colour. The choanosome is dark yellow at the centre and bright green at the periphery, the two colours merging into each other at two-thirds the distance from the centre to the periphery. Numerous large glistening white fibres run from the centre radially in all directions; in the cortex one of them spreads out at the base of each conule.

For the study of spicules preparations were made as follows:—From a freshly collected sponge a small piece was cut in any desired region, placed upon a microscope-slide, and covered with a few drops of KOH or NaOH solution; the slide was then held with forceps over a low alcohol flame at a sufficient distance so that the fluid would not quite boil but would become hot enough to soften the tissue. The alkali was then washed off with water from a pipette, and a cover-glass placed over the softened tissue and pressed down flat with a needle. This procedure was carried out with fragments taken at various points along the radius of a large number of specimens.

The sponge contains four kinds of spicules:—(1) *Megascleres*, typically strongyloxeas, but with the ecactine often rounded, 1.0 to 1.4 mm. long by 13 to 16  $\mu$  in diameter, with smaller forms down to 0.36 mm. by 6  $\mu$ . (2) *Spherasters*, ranging from 30 to 50  $\mu$  in diameter, with straight, abruptly pointed, oxeate actines, very abundant in the cortex, especially in its deeper portion, and at the periphery of the choanosome, but exceedingly rare elsewhere. (3) *Oxyasters*, 28 to 35  $\mu$  in diameter, with slender rays, usually six in number, straight and unbranched, though occasionally curved or bent and rarely branched. These are found occasionally in the outer half of the cortex and are fairly abundant in the inner half, while throughout the entire choanosome they are very numerous, by far the most abundant microscelere. (4) *Chiasters*—6.6 to 13.3  $\mu$  in diameter, and tylote—form a dense sheet at the periphery of the cortex, and are abundant through the remainder of the cortex and outer choanosome, but exceedingly rare in the deeper parts of the choanosome.

Several entire buds of various sizes, after having been treated as described above, have been examined and found to contain the same four classes of spicules which occur in the adult sponge. The structure of the various filaments sent out by this sponge was studied from teased living material. The anchoring filaments, bud-stalks, and fibres projecting from buds are composed of a core of megascleres surrounded by a dense layer of amoebocytes, among which are scattered numerous chiasmata. A few spherasters are found, especially in the little swellings at the ends of filaments.

*Donatia seychellensis*, first observed in Milbrook and Fairyland Creeks the first week in September, became more and more abundant, and the buds more numerous, until about the end of the month. By the middle of October there was a marked falling off in numbers, and those found were small and with few buds. During the winter only occasional specimens could be found. A recent collection, made on May 14, was a little more successful; it resulted in eight small specimens without buds.

Search has been made for *D. seychellensis*, as well as for other species here described, in most of the common shore collecting-grounds about Bermuda. In only one locality, besides the creeks mentioned above, has *D. seychellensis* been obtained, viz., on the shore of Agar's Island, where at low-tide level a few specimens have been found attached to stones. A careful search with a water-glass upon the reefs at Daniel's Head Flat failed to reveal any species of *Donatia*, as have also dredgings in Great Sound.

## II. *Donatia ingalli* (Bowerbank).

The two sponges here classified as varieties of *D. ingalli* do not correspond in all points with previous descriptions of that species; but in view of the fact that these descriptions have generally been based upon small numbers of preserved specimens, with no data as to the variations displayed by any one species in its natural habitat throughout the different phases of its reproductive cycle, it seems to me that nothing short of differences in the more fundamental points of internal anatomy warrants the recognition of separate species; and between *Donatia ingalli* as previously described and the Bermuda varieties there are no differences of this nature. On the other hand, in cases where both the animals in question are available in the living condition in unlimited numbers, superficial characters, if constant, are a sufficient reason for separating species; on these grounds there can be



no hesitation in recognizing these Bermuda varieties as specifically distinct from the Bermuda *Donatia seychellensis*, though they possess practically the same spiculation.

*Variety A.*—In the same habitat as has been described for *D. seychellensis* there was found, a little later in the season, an abundance of bright green spherical sponges slightly larger than *D. seychellensis*. On the 1st of September, when *D. seychellensis* was fairly numerous and even beginning to bud, only occasional specimens of the green form were obtained, and it was not until Sept. 18 that the first bud was seen. The surface of these sponges is raised into rounded hillocks, which are themselves composed of smaller rounded elevations. The cortex is much more fleshy and dense than that of *D. seychellensis*, and is solid, instead of showing a network of strands between the conules. The colour is uniform over the entire surface, with a slight variation among different individuals from dark bright green to a more nearly olive tint; in alcohol it is pink to light orange. There is a range of diameter from 11 to 32 mm., though specimens larger than 25 mm. are exceptional. The buds are clear bright green, and their form and arrangement are as in *D. seychellensis*. There are usually either one or two oscula, occasionally three or more, and in case of two or three they have a typical arrangement side by side 1 to 2 cm. apart. They are exceedingly conspicuous structures by reason of the modification of the conules about the oscula into long plates, which stand up around the opening and may project as much as 1 cm. beyond the general surface of the animal. A cross-section of this sponge shows the cortex to have twice the thickness of that of *D. seychellensis*; it consists of a thin, white, fibrous inner layer and a very thick, fleshy, green layer. The choanosome is dark yellow, and has at its centre a white fibrous core about 2.5 mm. in diameter, from which the radiating bundles proceed and spread out beneath the conules.

The spicules are in form and size similar to those of *D. seychellensis*, but differ somewhat from the latter in distribution and especially in the degree of branching of the oxyasters. (1) The *megasclores* are stronglyloxeas, with the eactine very frequently rounded, and range from 0.35 to 1.6 mm. in length and from 6.6 to 23  $\mu$  in diameter. (2) *Spherasters* similar to those of *D. seychellensis* are fairly frequent in all regions of the sponge and are exceedingly numerous in the cortex. (3) *Chiasters* are numerous throughout, and especially abundant in the cortex, at the

periphery of which they form a dense sheet; in addition to the usual tylote form there are some with oxate actines. (4) The *oxyasters*, as contrasted with those of *D. seychellensis*, are commonly bent, evenly curved, or branched; they are very abundant throughout the choanosome, but relatively sparse in the cortex, especially its outer layer.

Though most abundant upon the eel-grass of tidal creeks, where it assumes a spherical form, *D. ingalli* variety A has a wider distribution in Bermuda waters than has *D. seychellensis*, and its form is modified to suit the various localities in which it occurs. Numerous specimens have been found attached to stones along the shore of Agar's Island at low-water mark, and these are usually flattened at the base to present a large area of attachment. In extreme cases the sponge is reduced to a hemisphere, or even grows over the edges of small stones, to irregularities in the surface of which it conforms. The anchoring filaments, which appear in *D. seychellensis* as slender fibres usually but two in number, are here heavy strands or even thick sheets, which grow out from the base of the sponge over its substratum. These sponges have been collected also from stones along the shores of Hungry Bay; while from the shore of Long Island and neighbouring islands have been obtained the largest specimens I have ever seen. They were attached by heavy anchoring strands to the vertical faces of rocks and at depths down to 2 fathoms, as contrasted with the very shallow positions in which all other specimens have appeared. This sponge has been much more frequent than *D. seychellensis* throughout the winter, but very sparse and lacking in buds as compared with its profusion and activity during the autumn months. In May it has been found in fair abundance, but with few buds, in the tidal creeks, not raised upon the eel-grass, but resting on the muddy bottom and upon dead shells.

*Variety B.*—Though the two varieties of *D. ingalli* are identical in most of their important anatomical characters, they are readily distinguished in their natural situations by their different external appearance; a few constant anatomical differences also permit one to distinguish between them after preservation. In the tidal creeks, on stones at low-water mark, and on the vertical faces of rocks at 2 fathoms depth, variety B occurs with variety A in about the proportion of 1 to 12. Its autumn budding-season coincides with that of variety A, and it is likewise fairly abundant upon the muddy bottoms of tidal creeks in early summer; but in this latter situation its degree of budding is noticeably greater than that

of variety A. It is prune-coloured, varying from purple to brown. In alcohol it is dull light brown with a pinkish cast. It shows less extremes of size than variety A, and has never been found with strongly developed anchoring filaments. The oscula, though of the same general character, are less pronounced, and in most cases their plates do not project conspicuously. The specimens which in the field are distinguished from variety A by these superficial characters, present upon study of their internal structure two points of difference from the more common green form:—(1) The cortex of variety A consists of a thin fibrous inner layer and a thick fleshy outer layer, while that of variety B, of equally conspicuous total thickness, is composed of a very thick fibrous inner cortex and a thin outer layer of fleshy material. Upon this point variety B agrees with the description given by Sollas of the cortex of *D. ingalli*, but both varieties have the great total cortex thickness mentioned by Dendy as characterizing the specimens of *D. ingalli* examined by him. (2) The cortex of variety B is densely packed with spherasters, a feature which agrees with the condition found by Dendy; while the cortical spherasters of variety A, though undoubtedly more numerous than in *D. seychellensis*, are far from being densely packed.

### III. *Donatia lynceurium* (auctorum).

*Donatia lynceurium* has apparently not passed through its season of greatest abundance and activity during the period covered by my observations. I have never found a single specimen in the eel-grass of the tidal creeks, and search in other localities has revealed only a few small animals without buds. These were attached to stones at low-water mark along the shore of Agar's Island. Their colour varies from light yellow to orange, the smaller ones being usually of the lighter hue. They range in diameter from 5 to 20 mm. None have been found attached to the stones by anchoring fibres, but the base is flattened, so that the centre of the radiating structures is not far above the region of attachment. The surface is covered with fine rounded elevations, which in a few of the larger specimens are modified into elongated plates about the osculum. A specimen of 20 mm. maximum diameter has a cortex 2 mm. thick, which consists of a very thin fibrous inner layer and a thick fleshy outer layer. The choanosome is dark yellow, fading into green at the periphery. There is a large fibrous core at the centre of the radiating bundles. The outer fleshy layer, yellow when the sponge is

alive, turns light pink in alcohol. There are three kinds of spicules:—(1) *Megascleres*, usually stronglyloxeas, but with the oxcate ends often rounded. (2) *Spherasters*, 40 to 46  $\mu$  in diameter, with a large centrum and thick, unbranched, abruptly pointed actines, of which 6 to 8 are visible in one plane; they are numerous in the cortex and the outer choanosome, but rare elsewhere. (3) *Chiasters*—usually stronglylote but sometimes faintly tylote, and with more than 6 rays—are very numerous throughout the entire sponge and densely packed in the outer half of the choanosome. They range in diameter from 10 to 16  $\mu$ , and are distinctly larger in the inner half of the choanosome than elsewhere.

Pembroke, Bermuda,  
May 25, 1917.

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### III.—*New Lepidoptera in the Joicey Collection.*

By L. B. PROUT, F.E.S.

#### Family Lemoniidae.

##### 1. *Sabalia barnsi*, sp. n.

♂.—74 mm.

Similar to *jacksoni*, E. M. Sharpe (Ann. & Mag. Nat. Hist. (6) v. p. 443, 1890), British East Africa, of which it may possibly be a subspecies. Abdomen beneath with the proximal segments more heavily blackened.

*Fore wing* slightly narrower; antemedian line (bar) thicker; no appreciable black dusting in the interspaces between  $R^3$  and  $M^1$ ; premarginal black band broader; proximal half of abdominal margin not blackened.

*Hind wing* with premarginal black band broadened distally so as to reduce the spots of the ground-colour by half or more as compared with *jacksoni*.

Chambezi Valley, Karunga River, 4500 feet, Jan. 1917 (*S. A. Barns*), type in coll. Joicey. Also a short series from 150–200 miles W. of Kambove, 3500–4500 feet, 9th–11th Oct. 1907 (*S. A. Neave*), in coll. Brit. Mus.

Neither of the descriptions of Karsch's species (*tippelskirchi*, Karsch, Ent. Nachr. xxiv. p. 293; *fülleborni*, id. ibid. xxvi. p. 354) can refer to this species; in the latter the fore wing is wholly black in the cell, etc.; the former may probably be nearer, but—apart from its considerably larger size—lacks the pale patagia. The structure of the fore legs will need closer attention than I have been able to give; in the type-specimen of *barnsi* they are lost.

### Family Geometridæ.

#### Subfamily HEMITHEINÆ.

#### 2. *Comibæna hypolampes*, sp. n.

♂.—30 mm.

Head white, the crown somewhat mixed with green, the palpus on the sides with brownish. Antennal pectinations not quite so long as in *chalybeata*, Moore. (Body discoloured in relaxing.)

*Fore wing* with SC<sup>1</sup> free, SC<sup>2</sup> arising considerably before SC<sup>5</sup>; bright green, finely strigulated and irrorated with white; costal edge narrowly white; two broad white transverse lines, the first straight, at about 5 mm. from base; the second slightly curved near costa (3 mm. from apex), then nearly straight to hind margin near tornus; some slight white clouding in distal area; no terminal line; fringe white.

*Hind wing* with frenulum slender; termen nearly rounded, a little straighter between the radials; SC<sup>2</sup> very shortly stalked, M<sup>1</sup> nearly connate; costal area white, the rest concolorous with fore wing; otherwise unmarked except by a very fine white line close to termen as in *Euchloris smaragdaria* or *chlorophyllaria*.

Fore wing beneath bright green, posteriorly nearly white, and with some white admixture in distal area; first line slight, second strongly developed; hind wing beneath green, with white irroration and strigulation, postmedian line of fore wing continued, bluntly bent at R<sup>3</sup>.

Vrianatong, Tibet.

Perhaps nearest *latilinea*, Prout, but quite different in the

absence of red terminal line, the presence of white subterminal on hind wing, etc.

Subfamily STERRHINÆ.

3. *Semæopus ciliata*, sp. n.

♂.—35 mm.

Head light reddish brown, the face becoming pale buff below. Palpus pale buff, marked with dark reddish brown on outer side. Antenna dentate, with rather long fascicles of cilia. Hind tibia and tarsus distorted, with masses of buff and pink hair and a single spur, much as in *indignaria*, Guen.

*Fore wing* with SC<sup>2</sup> from cell, R<sup>2</sup> from very slightly before middle of DC; pinkish buff, very finely dusted with grey; lines grey or brown-grey, very fine; antemedian straight and rather oblique from one-third hind margin, obsolete in front of SC; median straight, parallel with termen at 5 mm. therefrom; postmedian strongly sinuous; cell-spot small, black, white-pupilled; terminal line not interrupted; fringe concolorous, usually with very feeble and minute dark dots at base opposite the veins.

*Hind wing* with termen almost smooth; antemedian line wanting; median slightly or very slightly bent in middle; postmedian less deeply sinuate than on fore wing.

*Underside* with similar markings, the antemedian line always wanting; the median on the hind wing weak or wanting; postmedian forming slight teeth on the veins; terminal line slightly thickened or even forming distinct dots between the veins; cell-dots small, not white-pupilled.

Chiriquí, Panama (*Arcé*), type in coll. Joicey. Sapucay, Paraguay (*W. Foster*), in coll. Brit. Mus. and Tring Mus. Tijuca, Brazil, in coll. Tring Mus.

Marvellously like the species which passes as *indignaria*, Guen. (though not agreeing very well with his description), which, however, has the antenna pectinate. Otherwise I can see no essential difference, though the cell-spots are in general minute. It should be added that if Guenée was in error regarding his locality (which he gives as "Brazil?"), his description would lead one to identify his *indignaria* with *absconditaria*, Walk., List Lep. Ins. xxvi. p. 1488, from Haiti and Cuba.

4. *Semæopus smithi*, sp. n.

♂.—34 mm.

Head and body mostly concolorous with wings, the face

and collar somewhat paler; palpus mostly dark red on outer side, whitish beneath, terminal joint very short. Antenna with moderate fascicles of cilia. Hind tibia and tarsus with strong tufts, mostly light-coloured; abdomen with lateral tuft somewhat developed.

*Fore wing* with termen smooth;  $SC^2$  about connate with  $SC^{3-5}$ ; rather glossy buff-pink, with extremely fine grey (in some lights slightly olive-tinged) irroration; costal margin more slightly irrorated; lines formed by condensation of the irroration, moderately well developed; antemedian rather weak at costal extremity, oblique outward, weakly bent in middle of cell, then very slightly sinuous to hind margin at three-sevenths, cell-spot annular, grey with a few whitish scales, its circumscription blackish; median line in the anterior half parallel with postmedian, midway between this and cell-spot, strongly oblique inwards from  $M^1$  to behind  $M^2$ , reaching hind margin at about three-fifths; postmedian sinuous, on the veins dentate outward; nearest the termen at  $SC^5-R^1$  and  $R^3-M^1$ , strongly inbent behind  $M^2$ ; terminal line extremely fine and weak (almost obsolete).

*Hind wing* with termen smooth,  $SC^2$  separate; antemedian line wanting, median rather weaker than on fore wing.

*Underside* much paler and rather more ochreous, the posterior part of fore wing and much of hind wing (except costal and distal regions) whitish with some iridescence; fore wing with costal margin red from near base to well beyond middle and with traces of postmedian line on anterior part, otherwise almost without markings.

Colombia (*H. H. Smith*), without more exact locality, taken in June.

### 5. *Semæopus preptocycla*, sp. n.

♂.—26 mm.

Head and body concolorous with wings.

*Fore wing* chocolate-brown, with fine, sparse, and quite inconspicuous black irroration; lines light brownish; antemedian fine and oblique outwards from two-sevenths costa, rather acutely angulated at  $SC$ , then almost straight to about two-fifths hind margin, very finely and slightly dark-edged distally; postmedian slightly less oblique than termen, not quite 3 mm. distant therefrom, forming a very gentle curve anteriorly, very finely and slightly dark-edged proximally; a large round black cell-spot (fully 1 mm. in diameter) with minute pale grey pupil; termen with triangular dots between the veins.

*Hind wing* the same, without antemedian line.

*Underside* paler ; cell-spots smaller, less deep black ; postmedian line present, but very weak.

Peruvian Amazons: Rio Ampiyacu, Putumayo, type in coll. Joicey ; Rio Pacaya, July 1912, in coll. Brit. Mus., presented by J. J. Joicey. Also in coll. Tring Mus. from Palma Sola, Venezuela ; Fonte Boa, Upper Amazons ; Palcazu, E. Peru ; and Yahuarmayo, S. Peru.

#### 6. *Ptochophyle ozophanes*, sp. n.

♂.—20 mm.

Face and palpus whitish, mixed with yellow and vinaceous. Vertex yellow. Antenna whitish, strongly mixed with vinaceous. Occiput vinaceous. Thorax and abdomen concolorous with wings.

*Fore wing* with areole small, all the subcostals rather long-stalked, SC<sup>1</sup> arising first ; pale lemon-yellow, so strongly irrorated with vinaceous or reddish as to make the colour appear dull orange, leaving somewhat less heavily irrorated areas here and there ; distal area slightly tinged with dull purplish ; cell-spot grey, large but not strong ; a slightly interrupted and irregular yellow line 2.5 mm. from and parallel with termen, thickened considerably between the radials and throwing out a tapering projection distally between R<sup>2</sup> and R<sup>3</sup> ; fringe chequered.

*Hind wing* with termen subcrenulate, slightly toothed at R<sup>3</sup> ; SC<sup>2</sup> and M<sup>1</sup> very shortly stalked ; slightly darker in distal part than in proximal ; a thick yellow line from abdominal margin just beyond middle, running in direction of apex, but terminating about R<sup>1</sup>, throwing out a small distal branch just in front of R<sup>3</sup>, a very slender proximal branch at its anterior end, and a thick bifurcating proximal branch about R<sup>3</sup> and forwards ; a yellow subterminal spot or dash about R<sup>2</sup> ; fringe chequered.

*Underside* glossy whitish yellow ; fore wing with vague vinaceous suffusions, leaving free most of the hind-marginal area and a broad but ill-defined postmedian band ; hind wing with still slighter suffusions, chiefly in distal half.

Perak, 2000–3000 feet (*W. Doherty*).

#### 7. *Ptochophyle dipyramida*, sp. n.

♀.—27 mm.

Face whitish yellow. Vertex vinaceous. Occiput mixed yellow and vinaceous. Antenna whitish yellow, strongly shaded above with vinaceous ; inner side with mere teeth, outer with very short stout pectinations. Thorax and abdomen above vinaceous, beneath cream-buff.



*Fore wing* with areole small,  $SC^1$  arising before  $SC^5$ ,  $M^1$  separate; vinaceous cinnamon to vinaceous; in costal region vaguely mottled with yellowish, in proximal part of cell and near base posteriorly with some bright yellow mottling; an irregularly pyramidal patch beyond cell and another from tornus, their apices closely approximated at  $M^1$ , the base of the former on  $SC^5$ ; a small yellow mark at termen in front of  $R^1$ , a second in front of  $M^2$  (adjoining the tornal pyramid); minute red terminal dots on the yellow parts; fringe yellow, with a slight vinaceous mark between  $R^3$  and  $M^1$ .

*Hind wing* with termen slightly bent at  $SC^2$ , almost right-angled at  $R^3$ , subcrenulate posteriorly;  $SC^2$  and  $R^1$  very shortly stalked,  $M^1$  barely stalked; unicolorous, with two dark vaguely connected dots on the discocellulars; fringe yellow, opposite  $R^3$  vinaceous.

*Underside* paler, with the pyramids, terminal spots, and fringes whitish; costal margin of both wings pale, at least proximally; bases mixed with very pale yellow.

Tenasserim Valley, E. of Tavoy, Burma (*Doherty*).

Belongs to the *Heteroctenis* section (Meyr., Tr. Ent. Soc. Lond. 1897, p. 72).

# 8. *Ptochophyle anisocosma*, sp. n.

♀.—20 mm.

Head and thorax deep red, mixed with blackish; abdomen dorsally brighter lake-red, laterally yellowish, dorsally pale.

*Fore wing* with  $SC^1$  arising before  $SC^6$ , lake-red mostly irrorated with blackish fuscous, the irroration strong proximally (especially anteriorly), becoming slight distally; an elongate yellow spot between the radials, well beyond the cell; a yellow dot at  $R^2$  between this and termen; slight yellow costal irroration near apex; a narrow yellow distal border, interrupted by the ground-colour between  $R^3$  and  $M^1$  and more slightly at apex, tornus, and  $M^2$ ; a few minute red terminal dots anteriorly; fringe yellow, mixed with lake-red between  $R^3$  and  $M^1$ .

*Hind wing* with termen only feebly bent at  $R^3$ ; DC slender, oblique,  $SC^2$  barely stalked,  $M^1$  about connate; without the dark irroration; a small yellow spot in end of cell; two interrupted bands of larger irregular postmedian spots, the proximal consisting of one between  $SC^2$  and  $R^2$  (connected posteriorly with the distal by a thin oblique mark) and one between  $M^1$  and tornus, the distal continuous from C to  $M^2$ , mostly narrow anteriorly, broad behind  $R^2$ ; yellow border still narrower than on fore wing.

*Underside* paler, similarly marked, costal region of hind wing pale yellowish except towards apex.

Sungei Ujong, Malay Peninsula (Durnford).

9. *Ptochophyle vinosa*, sp. n.

♀.—22 mm.

Head and body above concolorous with wings; face whitish, vinaceous below; vertex whitish, yellow between the antennæ; beneath, with the legs, predominantly whitish.

*Fore wing* with termen scarcely oblique in anterior half, curving so as to become very strongly so posteriorly; areole small,  $SC^1$  arising before  $SC^5$ ; vinaceous, very densely irrorated with bluish, giving it a lilacine tone; markings pale yellow; a subtriangular costal spot at one-fifth; an exceedingly slender streak along costa before middle; a much broader one beyond middle, from the anterior end of which a narrow irregular band runs across the wing to tornus, strongly constricted at  $M^2$ , then widened into a tornal patch; some interneural subterminal dots, that between  $SC^5$  and  $R^1$  farthest from termen; some irregular, partly elongate or confluent, terminal spots; fringe yellow, marked with lilacine opposite  $R^3$ .

*Hind wing* rather elongate, with termen curved, strongly bent at  $R^3$ ; DC oblique,  $SC^2$  short-stalked,  $M^1$  about connate; lilacine with terminal spots and fringe (except opposite  $R^3$ ) yellow.

*Underside* paler; fore wing at base and along most of hind margin whitish; costal margin mixed with yellowish; otherwise as above.

N. Borneo (*Pryer*), type ♀, Elopura, off N. Borneo (*Breyer*), both in coll. Joicey.

Specimens which are probably the ♂ to this ("Borneo" and Sandakan) stand in coll. Brit. Mus. under the MS. name of *vinosa*, Warr.; they are strongly mottled with yellow in the central area of the fore wing and throughout the hind wing, and have a more or less complete, though narrower, antemedian band, arising in the cell, but slenderly connected with the posterior extremity of the first costal spot. The sexual difference would be somewhat analogous, though not strictly parallel, to that obtaining in *permutans*, Hamps. (Ill. Het. viii. p. 123), and in *togata*, F. (Supp. Ent. p. 454) = *amaenaria*, Snell. (Tijd. Ent. xxxiii. p. 222) = *auricincta*, Hamps. (Ill. Het. ix. p. 149), of which latter *deviaria*, Walk. (List Lep. Ins. xxii. p. 664), must surely, by analogy with *permutans*, be the ♂.

10. *Cosymbia dyschroa*, sp. n.

♀.—24 mm.

Face pale olive. Palpus nearly twice as long as diameter of eye, third joint slender, about half as long as diameter of eye; pale olive above (third joint narrowly darkened), rather paler beneath; crown, thorax, and abdomen concolorous, the vertex very narrowly white in front.

*Fore wing* rather broad, apex acute, minutely produced, termen nearly straight, tornus pronounced; glossy smoke-grey with a slight olive tinge, somewhat sprinkled with bluish-silvery scales; costal region with some purplish dots, mostly very minute, a few on the margin itself (especially near apex) less so; lines indicated by dark vein-dots; ante-median outbent in middle, only the dots on M and SM well developed; postmedian from beyond two-thirds costa, very gently excurved in anterior half and incurved in posterior; cell-spot elongate but small, white, very slightly dark-edged; traces of a very faint greyish median shade beyond it, curved parallel with postmedian; terminal line dull purple, very slightly lunulate, appearing more so on account of the slight interruption at vein-ends and confluence with small concolorous dots at base of fringe opposite the veins; fringe otherwise cream-buff.

*Hind wing* with apex rectangular, termen bent at  $R^3$ ; nearly as fore wing; circumscription of cell-spot stronger, median shade straighter, touching the cell-spot.

Both wings beneath paler, inclining to bluish white; fore wing except posteriorly, hind wing at apex only, flushed with pink; a white cell-dot indicated on both wings, a row of small weak postmedian dots on fore wing only.

Caparo, W. Trinidad (*F. Birch*).

The coloration recalls *Zalissolepis violacearia*, Guen. (Spec. Gén. Léop. ix. p. 386), more than any other known *Cosymbia*.

11. *Pisoraca diplosticta*, sp. n.

♂.—32 mm.

Face dull reddish. Palpus fully twice as long as diameter of eye, with third joint long; red above, whitish ochreous beneath. Vertex and antennal shaft whitish ochreous, somewhat spotted with reddish. Thorax and abdomen nearly concolorous with wings, the abdomen somewhat redder above. Hind femur fringed with fine whitish hair beneath; hind tibia with the proximal spur short.

*Fore wing* with arcole rather small; pinkish buff with a

very slight (at costal margin rather thicker and greyer) darker irroration; lines weak, vaguely greyish; antemedian at little beyond one-fourth, somewhat excurved and sinuous, chiefly indicated by dark dots on the veins, median shade broader, lunulate-dentate, arising at about three-fifths costa, incurved between  $M^1$  and  $SM^2$ ; postmedian fine, shallowly lunulate, but scarcely traceable except on the veins, where it is marked by strong black dots (very slightly elongate) at about 2.5 mm. from termen, slightly incurved at costa; cell-mark slightly raised, very feeble, elongate, very slightly and incompletely dark-edged; both the series of terminal dots sharply expressed, those on the veins smaller than those between; fringe slightly more ochreous proximally.

*Hind wing* with termen slightly waved;  $SC^2$  just stalked (type) to just separate; similar to fore wing, the cell-dot whiter, less elongate, more strongly dark-edged.

*Underside* of fore wing more flesh-coloured, at hind margin whitish, of hind wing whitish, mixed with flesh-colour distally; fore wing with median shade faintly traceable in flesh-colour; both wings with flesh-coloured postmedian line, marked with brown dots on the veins; terminal dots developed, the interneural rather less black and more diffuse than above.

Bitje, Ja River, Cameroons, 2000 feet, dry season (*G. L. Bates*), type in coll. Joicey. A ♂ from the same locality and two from Lake Azingo, Gaboon, in coll. Tring Mus.

I do not think this can be a local race of *caccaria*, Guen. = *deremptaria*, Walk., from South Africa, which has the cell-mark of fore wing smaller and rounder, but of which no good specimens are accessible to me. If, as I suspect, *lyciscaria*, Guen. = *bitactata*, Walk., is an aberration of the latter, it appears to have the hind femur glabrous or nearly so.

## 12. *Hamalia apiozona*, sp. n.

♀.—22 mm.

Head and body cream-buff; palpus darkened on outer side; thorax and abdomen dorsally with some darker admixture, a brown belt at base of abdomen.

*Fore wing* rather narrow, termen oblique, smooth, nearly straight;  $SC^2$  arising well before end of cell; white, mostly covered with light pinkish-buff markings; a very strongly outbent white line at one-fourth (accompanied by some whitish shading proximally), bounding the median area proximally; median area forming a very broad band, of which the distal edge is very acutely angulated outwards on

R<sup>1</sup>, here (and nearly to R<sup>3</sup>) confluent with the proximal shading of subterminal line, posteriorly more oblique than termen, reaching hind margin at middle; a minute dark cell-dot at base of R<sup>2</sup>; subterminal line white, with irregular brown shadings on both sides, slightly oblique inwards at costa, then forming a deep outward curve (with its extremity on R<sup>1</sup>), slightly inbent before R<sup>3</sup>, sinuate inwards between M<sup>2</sup> and SM<sup>2</sup>; a rather conspicuous subtriangular white spot close to apex; dark dots at termen before and behind R<sup>1</sup>, accompanied proximally by small white wedges; the posterior part of terminal area irregularly mixed with light violet-grey and (towards tornus) blackish; fringe pale brownish, unmarked.

*Hind wing* rather narrow, termen rounded anteriorly, then almost straight; a rather strong subbasal brown band; median band very feeble and ill-defined, separated from a better expressed brown submarginal band by a white shade; a very narrow white distal border, marked at apex with a brown dash and between some of the veins with brown dots; fringe unmarked.

*Underside* whitish, the hind wing almost unmarked, the fore wing becoming browner anteriorly, and with a dark brown terminal border from tornus to R<sup>1</sup>, becoming lighter brown and subterminal anteriorly.

Rio Derg, Brazil, type in coll. Joicey. Rio Janeiro, para-type in coll. Brit. Mus.

### 13. *Pigia flexistrigata extensa*, subsp. n.

♂.—25–27 mm.

Much larger than *flexistrigata flexistrigata*, relatively longer-winged (termen of fore wing more oblique), underside less sharply marked, with median line of hind wing obsolete.

Carabaya, S.E. Peru: Oconeque, 7000 feet, Feb. 1905 (*G. Ockenden*), type in coll. Joicey; July 1904 (dry season), 1 ♂ in coll. Tring Mus.; Santo Domingo, Nov. 1902 (wet), 1 ♂ in coll. Tring Mus.

Possibly a separate species.

Except in the angulated hind wing this species (described by Warren, Nov. Zool. vii. p. 150, as a *Craspedia*) does not differ in material characters from *Pigia* (type *tergeminaria*, H.-Sch.=*microniata*, Walk.).

### 14. *Antitrygodes callibotrys*, sp. n.

♂.—36 mm.

Face and outer side of palpus light reddish brown. Head,

thorax, and abdomen concolorous with wings, the upperside of thorax with the black speckling rather copious, of abdomen with a few small brown spots. Antenna with short pectinations, at least as long as diameter of shaft, surmounted by strong fascicles of cilia. Hind tibia thick, with dark hair-pencil; tarsus scarcely one-half as long, tapering. Abdomen with lateral tufts not strong.

*Fore wing* with  $SC^1$  well free, not even bending towards  $SC^{2-5}$ ,  $R^2$  from before middle of  $DC$ ; flesh-colour with a vinaceous tinge; proximal part with black speckling, distal with exceedingly fine, scarcely noticeable, olive-green irroration; first line light brown, speckled with black, sinuous, posteriorly oblique outwards; median area with the cluster of olive-green spots large, partly black-edged, distally again very finely whitish-margined; an elongate black cell-mark amongst them, attenuated in its middle, followed by a black dot at bifurcation of  $R^3$  and  $M^1$ ; postmedian line light brown, oblique outwards from three-fifths costa, strongly bent at  $R^1$ , then approximately parallel with termen; submarginal line rather darker, slenderer, sinuous, followed distally by bipartite olive-green spots between the radials and between  $M^2$  and  $SM^2$ ; terminal line scarcely interrupted, slightly thickened between the veins; fringe tipped with brown, a fine whitish line at base.

*Hind wing* with termen very feebly crenulate, with a just appreciable angle at  $R^1$ ; first line wanting; green central spots corresponding to those of fore wing, the posterior ones (between  $M^1$  and  $SM^2$ ) smaller, not reaching beyond fold; postmedian line not bent at  $R^3$ ; subterminal nearly as on fore wing; submarginal spot between radials reduced to a small triangular or V-shaped mark on  $R^2$ , subterminal nearly obsolete.

Both wings beneath with postmedian, subterminal, and terminal lines well developed.

Upper Kasai district, Congo Free State (*F. Landbeck*), type in coll. Joicey. Entebbe, Uganda (*E. A. Minchin*), paratype ( $\sigma$ ) in coll. Brit. Mus.

Apart from the difference in markings, this is distinguished at once from *dentilinea*, Warr., by the venation and the pectinate  $\sigma$  antenna. I have elsewhere (Mitt. Deutsch. Ent. Mus. iii. p. 241) noticed the frequent loss of the areole in *A. divisaria divisaria*, Walk., and may add that I have found the same phenomenon in *A. agrata*, Feld., and *A. parvimaacula*, Warr.; but in these cases  $SC^1$  still approaches  $SC^2$  at the point where the distal wall of the areole is normally formed, whereas in *callibotrys*—and often in *vicina*, Th.-Mieg, from the Khasis, possibly a race of *agrata*—it runs parallel.

15. *Metasiopsis trichroa*, sp. n.

♀.—20 mm.

Face blackish; palpus pale beneath. Vertex narrowly yellowish; occiput mixed with blackish; collar rosy. Thorax and abdomen yellow, much mixed with rosy above.

*Fore wing* with  $SC^2$  arising from cell; glossy yellow; proximal area, as far as the oblique, somewhat sinuous antemedian line (or band), predominantly peach-blossom pink, costal margin broadly but not very definitely suffused with pink, in proximal part also slightly with dark purple-grey; median pink line thickest anteriorly, slightly sinuous; postmedian irregular, bent outwards to  $M^1$ , interrupted between the medians, thick behind  $M^2$ , partly confluent with a pink tornal spot; some slight pink apical suffusions; just proximal to the antemedian line in the cell is placed a small blackish-slate spot, on the anterior half of the postmedian band a similarly coloured line; fringe pale yellow.

*Hind wing* with termen shallowly sinuate between the radials, slightly toothed at ends of veins;  $SC^2-R^1$  moderately stalked; proximal half yellow with ill-defined sinuous antemedian and median lines, distal half predominantly pink, but with irregular spots of the ground-colour, suggesting a sinuous or dentate transverse band; fringe pale yellow.

*Underside* somewhat paler yellow with similar but weaker markings, the antemedian and median lines of hind wing obsolete behind cell, the distal pink shading of hind wing much feebler, suggesting two thick sinuous lines.

Bonda, Colombia, 150 feet (*H. H. Smith*), type and another in coll. Joicey.

Suggestive of *radaria*, Schs., and other pink-and-yellow species, but with the superimposed purple-grey markings characteristic.

16. *Ptychopoda complexaria amazonensis*, subsp. n.

*Somatina eburneata*? (part.), Butl., Tr. Ent. Soc. Lond. 1881, p. 340 (indescr.), nec Guen.

Differs from *complexaria complexaria*, Schs. (Tr. Amer. Ent. Soc. xxvii. p. 257), S.E. Peru, in lacking the black spots on abdomen, in having the spots of the proximal half of fore wing reduced in size, those at the end of the cell united into a ring, the subterminal spots well defined between the radials, and generally between  $R^3$  and  $M^2$ , as well as at hind margin. Abdomen more or less strongly belted with ochreous brown.

Contamama, Rio Ucayali, Peruvian Amazons, Oct.-Dec.,

type in coll. Joicey. Rio Pacaya, Peru, July 1913, 1 ♂ in coll. Brit. Mus. (presented by J. J. Joicey). Urucaca, Rio Jurua, Amazons, November 9th, 1874, 1 ♂ in coll. Brit. Mus. (*Bull.* l. c.). Fonte Boa, Upper Amazon, July 1906 and July 1907 (*Klages*), in coll. Tring Mus.

17. *Ptychopoda deliloides*, sp. n.

♂.—18 mm.

Face and upperside of palpus black. Vertex and base of antenna white; ciliation rather short. Occiput walnut-brown. Thorax above reddish, anteriorly mixed with black, posteriorly with white; abdomen above reddish, somewhat mixed with white, especially towards anal end. Hind tibia rather large, thick and tufted, tarsus strongly abbreviated.

*Fore wing* with areole moderate or rather long, rather narrow, all the subcostals stalked from its apex; mostly walnut-brown, with fine white irroration; base of costa blackish, the white scaling strong in the rest of the proximal area, developing into an ill-defined white line at the edge of the median area, which runs very obliquely outwards from costa, is acutely angulated subcostally, and then very oblique inwards to hind margin; median area very broad, costally mixed with white, its edges slightly darkened; an indistinct dark cell-mark and traces of a dark median line near to and parallel with the antemedian, but not angulated subcostally, touching the cell-mark; a very irregular white line distally to the median area, angulated at  $R^1$ , slightly sinuate inwards between  $R^1$  and  $R^3$ , very near the termen between  $R^3$  and  $M^2$ , rather deeply sinuate inwards between  $M^2$  and  $SM^2$ , again angulated on  $SM^2$ ; a white subapical and slighter central suffusion distally; a white line close to termen, slightly receding therefrom at costa; a dark terminal line; fringe whitish brown or almost white, with darker and redder spots opposite the veins.

*Hind wing* with  $SC^2$  and  $R^1$  quite shortly stalked; red nearly to base; two white distal lines corresponding to those of fore wing; terminal line and fringe as on fore wing.

Fore wing beneath almost entirely suffused with vinaceous, hind wing partly rosy but generally more mixed with white, especially posteriorly and towards distal margin, where a rosy line remains observable between the two white lines of the upperside.

Pozuzo, E. Peru (*J. Egg*). Type in coll. Joicey, others in coll. Tring Mus. Also occurs in Colombia, Ecuador, Bolivia, French Guiana, and Amazons.



Except in the less glossy wings more recalls the *adela* group of *Hamalia* (especially *delila*, Schs., Ann. & Mag. Nat. Hist. (8) ix. p. 430, as *Dithadama*) than any *Ptychopoda* with which I can compare it.

18. *Flavinia stenochora*, sp. n.

♀.—37 mm.

Head black, narrowly white round the eye. Palpus short. Body black, the abdomen with an interrupted yellow stripe on the side and white line beneath.

*Fore wing* with areole single, narrow, in one example almost suppressed;  $DC^3$  oblique,  $R^2$  arising near (in the type even close to)  $R^3$ ,  $M^1$  widely separate, black, with the proximal yellow patch narrow, not crossing  $M$  or  $SM^2$ ; subapical yellow patch rather broad; fringe black.

*Hind wing* rather elongate; yellow, with rather broad black borders, the abdominal tapering to a point proximally, the anterior crossing  $SC$ , so as to enter the cell, but distally thereto bounded by the stalk of  $SC^2$  and  $R^1$ .

*Underside* similar, the fore wing with a yellow posterior streak in proximal part of cell.

Minas Geraes, Brazil, type in coll. Joicey, ex. coll. Gr.-Sm. 2 ♀♀ from the Milne collection, without locality, have for more than half a century stood in coll. Brit. Mus., originally mixed by Walker among his *approximans*, List Lep. Ins. ii. p. 370 (*isis*, Hb.).

Perhaps near *dubia*, Schs., distinguished by the venation, by the proximal patch of fore wing not entering the cell, the white line on venter, yellow streak on cell of fore wing beneath, etc. The exceptional position of  $R^2$  of fore wing—hitherto only known, in this family, in a few *Geometrinæ* and one or two *Larentiinæ*—may betoken generic divergence.

Subfamily *LARENTIINÆ*.

19. *Mennis ficulnea albifera*, subsp. n.

♂.—34–37 mm.

Smaller than *ficulnea ficulnea* from Ecuador, ground-colour redder, distal borders generally broadened; fore wing with a more or less extended white posterior patch, commencing at a point close to base, broadening rapidly, bounded distally by the black border; hind wing also frequently with some whitish shading between the ground-colour and the border posteriorly.

Charape, River Tabaconas, N. Peru, 4000 feet, 1912, the more exactly labelled specimens dated Sept.-Oct. (*A. & E. Pratt*).

Subfamily GEOMETRINÆ.

20. *Cleora clarivenata*, sp. n.

♂.—54 mm.

Face flat. Palpus rather short and stout, with moderately appressed scales. Tongue slight. Antennal pectinations very long, continuing to near apex. Pectus strongly hairy. (Hind legs lost.) Head and body concolorous with wings, the abdomen with ochreous anal tuft and with indications of white distal edgings to the segments above, only the first distinct.

*Fore wing* with fovea slight;  $SC^{1-2}$  moderately long-stalked, separating about opposite the branching of  $SC^5$ , not connected with C or  $SC^3$ ; Prout's brown, with some of the veins (especially M,  $R^1$ ,  $R^3$ ,  $M^1$ , the end of  $SC^5$ , and, more finely,  $M^2$ ) yellowish white; lines yellowish white; antemedian acutely angulated inwards close to costa, then forming an outward curve or bend, from M strongly oblique inwards to hind margin near base; postmedian about 3 mm. from termen, nearly parallel therewith, very slightly approaching it at hind margin.

*Hind wing* with termen weakly subcrenulate; similar to fore wing;  $SM^3$  also whitened; antemedian line wanting; postmedian slightly bent at radial fold.

*Underside* slightly paler, without white veins; antemedian line wanting, postmedian a little less strong than above.

Upper Kasai River, Congo Free State (*F. Landbeck*).

21. *Callhistia grandis latiplaga*, subsp. n.

Yellow band of hind wing considerably widened, at abdominal margin generally measuring 11 mm., never less than 9 mm., its form in the ♂ almost quadrate, its anterior boundary in the ♀ (in front of the second subcostal vein) 7-9 mm. long.

Mysol, foothills, 100-200 feet, Oct.-Nov. 1916, wet season (*W. J. C. Frost*), type and another ♂, 6 ♀ ♀.

IV.—On the Striped Squirrels hitherto referred to the Genus *Paraxerus*. By OLDFIELD THOMAS.

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THE genus *Paraxerus*, as restricted in my paper on the genera of African *Sciuridæ*\*, contains two superficially distinct sets of species—those of uniform colour, or, at most, with an indistinct whitish line down each side of the back, and those with four† conspicuous black bands down the dorsal area with white or yellowish lines between them.

In connection with an examination of some striped squirrels brought by Major Christy from the Bahr-el-Ghazal, I have again studied the skulls of the members of these two groups, and find that there are certain cranial and dental characters by which they can in all cases be distinguished from each other. It would, therefore, appear convenient that groups so conspicuously different externally should be separated generically. The unstriped species will therefore bear the name of *Paraxerus*, with *P. cepapi* as genotype, while those that are striped may form the following new genus:—

*TAMISCUS*, gen. nov.

Dorsal surface conspicuously black-striped.

Skull on the whole as in *Paraxerus*, with similar short muzzle. Anteorbital foramen forming a high narrow slit, that of *Paraxerus* more subtriangular, broader at base.

*Teeth*. Incisors generally thrown more forwards, those of *Paraxerus* forming an angle with the tooth-row of about 80° (75° to 85°), while those of *Tamiscus* are usually about 90° more or less, attaining 100° in the type of *T. vulcanorum*. The terminal wearing-edge notched, very much as in *Mus*, those of *Paraxerus* being quite normal, as in *Rattus*.

Molars less hypsodont, the crowns more abruptly marked off from the roots. Looking at these teeth from the inner side, the large internal root is narrow, well-spaced from its neighbours on each side, and abruptly broadens out above at the crown. In *Paraxerus*, on the other hand, this root is proportionally larger below, so as more nearly to approach its neighbours, and quite gradually broadens upwards to the crown. Owing to the greater size of the roots in *Paraxerus*, their tips are more generally visible on the upper side of the maxillary than in *Tamiscus*.

Genotype. *Tamiscus emini* (*Sciurus emini*, Stuhlman).

\* Ann. & Mag. Nat. Hist. (8) iii. p. 467 (1909).

† Two only in *alexandri*.

The forms referable to this genus appear to be as follows :—

1. *Tamiscus böhmi*, Reich.

*Sciurus boehmi*, Reich. Zool. Anz. ix. p. 315 (1886).

Dark lines on back not deep black, but lightened by inter-mixed greyish or buffy hairs. Edges of ears lighter than general colour of head.

Marungu (*Böhm*), Mweru (*Sir A. Sharpe*).

2. *Tamiscus emini*, Stuhlmann.

*Sciurus emini*, Stuhlmann. Mit Emin Pascha, p. 320 (1894).

Dark lines of back strongly contrasted glossy black. Edges of ears (proectote and antitragus) not lighter than rest of head; a small whitish patch behind them.

Incisors not specially thrown forwards; comparatively thick, about 1.6 mm. in antero-posterior diameter at their exit from the base in adult specimens.

2 a. *Tamiscus emini emini*.

*Sciurus emini ugandæ*, Neum. SB. Ges. Nat. Berl. 1902, p. 180.

General colour strong olivaceous. Dark stripes variable in breadth, the outer ones well marked, well over 2 inches in length.

Semliki River (*Stuhlmann, Carruthers*) (type-locality); Congo area westwards to the Ubanghi (*Boyd Alexander*), Welle and Ituri Rivers (*Emin, Boyd Alexander, Christy, and others*), Ruwenzori and Fort Portal (*Woosnam*), Unyoro (*Ansorge*), Businde, Uganda (*Blaine*), Entebbe (*Jackson*), Kampala (*Neumann*).

I fail to find any distinction between the series from the Congo area and those from Uganda. The breadth of the dorsal stripes, used by Neumann to characterize his subspecies *ugandæ*, proves to be absolutely variable in every locality, as also do the sizes of the teeth and the bowing of the skull, in which respects differences are observable between different specimens.

2 b. *Tamiscus emini gazellæ*, subsp. n.

General colour of true *emini*, but body-colour much paler and greyer. Flanks near "dull citrine" of Ridgway, head and shoulders rather greyer. Proectote of ears coloured quite like the crown, but the edge of the antitragus may be a little lighter. Dark dorsal lines reduced in extent, the outer narrower and shorter, little more than an inch in length.

Under surface greyish, with but little olive infusion. Tail slender, its edges ochraceous yellow.

Hind foot of type 30 mm.

Skull: greatest length 35·5; upper tooth-series exclusive of  $p^3$  5·7.

*Hab.* Meridi, Bahr-el-Ghazal.

*Type.* Adult male. B.M. no. 17.10.4.4. Original number 5. Collected January 1916 and presented by Major Cuthbert Christy. Four specimens.

A paler northern form of *T. emini*. The genus had not been previously recorded from the Nile drainage-area.

### 3. *Tamiscus vulcanorum*, sp. n.

Size rather smaller than in *T. emini*. General colour rather brighter and more yellowish olivaceous, with strongly contrasted stripes. Edges of ears (proectote and antitragus) lighter than general colour of head. No white spot on sides of neck behind ears.

Incisors slenderer than in *T. emini*, their antero-posterior diameter about 1·4 mm.; generally more proodont\* than in *emini*. Molars small.

The members of *Tamiscus* from Ruwenzori southwards, as represented by specimens from three different places, all differ from *T. emini* by their light-edged ears and certain other characters which indicate differences from that animal. But while the specimens from each locality are closely similar *inter se*, it is difficult to name any character except that of the ears which will distinguish the whole of them from *emini*. Further material from their somewhat inaccessible habitats will be needed before their true relationships can be worked out; but I would provisionally consider them as one species with three subspecies, as follows:—

#### 3 a. *Tamiscus vulcanorum vulcanorum*.

Fur long, soft, and rich; axillary patches not naked, practically hidden by thin fur. General colour of head and flanks near "dull citrine." Black stripes glossy black, the inner pair broad, broader than the yellowish median line between them; the outer pair narrow, little developed, shorter both in front and behind than the white stripes internal to them. Under surface washed with yellowish green ("pyrite yellow").

\* The words proodont, orthodont, and opisthodont (on the analogy of prognathous &c.) might be suggested to express the set of rodent incisors, thrown forward, upright, or turned in backwards respectively.

Incisors slender, proodont ( $93^{\circ}$  to  $100^{\circ}$ ). Molars very small.

Dimensions of type (measured in flesh) :—

Head and body 135 mm.; tail 116; hind foot 35; ear 14.

Skull : greatest length 36; condylo-incisive length 32.8; upper tooth-series exclusive of  $p^3$  4.9.

*Hab.* (of type). Buhamba, near Lake Kivu, in Belgian Congo. Alt. 6500'. Other specimens from Burunga, Mt. Mikenso.

*Type.* Adult male. B.M. no. 11. 12. 3. 64. Original number 2194. Collected 4th June, 1911, by Robin Kemp. Four specimens.

### 3 b. *Tamiscus vulcanorum lunaris*, subsp. n.

Fur less long and soft than in *vulcanorum*. General colour of head and sides dark greyish olive, duller and more smoky than in other forms. Dorsal dark stripes not glossy black, but mingled with greyish, the inner pair narrower than the comparatively broad yellowish median band between them; outer dark lines little conspicuous. Under surface washed with yellowish olive.

Incisors proodont, slender. Molars small.

Dimensions of type (measured in the flesh) :—

Head and body 125 mm.; tail 154; hind foot 33; ear 16.

Skull : greatest length 36.5; condylo-incisive length 32.5; upper tooth-series exclusive of  $p^3$  5.3.

*Hab.* Ruwenzori East (Mubuku Valley). Alt. 6500'.

*Type.* Adult male. B.M. no. 6. 7. 1. 54. Original number 264. Collected 7th February, 1906, by Douglas Carruthers. Presented by the Ruwenzori Exploration Committee. Two specimens.

This animal was obtained halfway up Mount Ruwenzori, side by side with specimens referable to *T. emini*. It will probably prove to be a mountain-form occurring upwards from that altitude, at which it just meets the common species of the lower levels.

### 3 c. *Tamiscus vulcanorum tanganyikæ*, subsp. n.

Fur not so long as in true *vulcanorum*; axillary patches large, quite naked. General colour as in *vulcanorum*, or even slightly lighter. Dark dorsal stripes glossy black, the inner ones broader than the very narrow median yellowish line; outer ones narrow, but extending the full length of the white lines internal to them. Edges of ears not so conspicuously

lighter than the head as in true *vulcanorum*, but still perceptibly so. Yellow spot on sides of nose particularly well marked. Under surface yellowish grey, more as in some of the forms of *emini*.

Incisors thicker than in other specimens of *vulcanorum*, 1.6 mm., therefore about as in *emini*. Molars comparatively large.

Dimensions of type (measured in flesh):—

Head and body 125 mm.; tail 151; hind foot 30.5; ear 14.

Skull: greatest length 35; condylo-incisive length 31.5; upper tooth-series exclusive of  $p^3$  6.

*Hab.* 10 miles west of Baraka, Burton Gulf, Lake Tanganyika, in the Tanganyika drainage-area. Alt. 4000'.

*Type.* Adult male. B.M. no. 7. 6. 14. 33. Original number 328. Collected 3rd January, 1907, by Douglas Carruthers. One specimen only.

This animal, while obviously distinct enough to deserve a subspecific name, is of somewhat doubtful relationship, and more specimens will be needed before the question can be settled. While its comparatively thick incisors and large molars are more as in *T. emini*, its general colour and light-edged ears approach those of *T. vulcanorum*, to which, mainly on geographical grounds, I provisionally refer it. But I should not be surprised if it turns out to be instead a southern subspecies of *T. emini*.

#### 4. *Tamiscus antonice*, Thos. & Wrought.

Ann. & Mag. Nat. Hist. (7) xix. p. 377 (1907).

Size much smaller than in the previous species. Colour yellowish grey, with four well-defined black stripes. Ears not lighter than head; no white patches behind them.

Greatest length of skull 31.5 mm.

*Hab.* Upper Congo. Type from Ponthierville, near Stanley Falls.

#### 5. *Tamiscus alexandri*, Thos. & Wrought.

Ann. & Mag. Nat. Hist. (7) xix. p. 376 (1907).

Size smallest of the genus. Colour yellowish. Stripes much reduced, the dark inner pair narrow and mixed with yellowish, and the outer pair almost imperceptible. Ears conspicuously white both on edges and backs.

Greatest length of skull 30 mm.

*Hab.* Welle and Ituri Rivers, eastwards into Uganda.

Semliki (*Neave*). Type (a slightly immature specimen) from the Upper Welle.

A young example of this species shows the outer dark lines more plainly than the adults.

V.—*Two new Tuco-tucos from Argentina.*

By OLDFIELD THOMAS.

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*Ctenomys latro*, sp. n.

Near *C. tucumanus*.

Size about as in *tucumanus*. General colour paler than the peculiar dark fawn of *tucumanus*, more as in *dorsalis*, buffy fawn on sides of head, on back, and on flanks, but the middle area of the face and crown dark brown. Under surface broadly washed with pale buffy ("light buff"), the throat whiter, and a patch on the chest darker, near "avellaneous," very like the belly-colour of *C. tucumanus*; the colours of upper and under surfaces rather sharply distinguished. Behind each ear a light buffy patch runs downwards and backwards on the side of the neck. Tail dark brown on whole breadth of upper surface, pale buffy on sides and below.

Skull of about the same general shape as in *C. tucumanus*, similarly low and flattened, though the brain-case is narrower. Muzzle unusually broadened, owing to a peculiar thickening of the bone outside the anterior half of the buried part of the incisors. Nasals broad, abruptly and squarely truncated behind, where they are considerably surpassed by the ends of the premaxillary processes, their sides forming straight converging lines instead of the curves found in *tucumanus*. Zygomata as widely expanded as in *tucumanus*, but distinctly shorter antero-posteriorly; a groove present along the upper outer edge of the malar, not found in any of our five skulls of *tucumanus*. Temporal ridges uniting to form a low median sagittal crest, the ridges being quite separated in older specimens of *tucumanus*. Supraoccipital smooth, without the median ridge present in adult *tucumanus*. Bullæ slightly smaller than in *tucumanus*, but still smooth and well inflated, not contracted as in *Ct. pontifex*.

Incisors of the normal set and usual orange-colour. Molars rather smaller and more delicate than in *tucumanus*,  $p^4$  exceeding the molars in diagonal diameter rather less than is



usual. The two rows of cheek-teeth a little nearer together than in *tucumanus*.

Dimensions of the type (measured by collector in the flesh):—

Head and body 170 mm.; tail 71; hind foot 29.

Skull: condylo-incisive length 45·2; condylo-basal length 43·6; zygomatic breadth 29; breadth across swollen part of muzzle 11·8; nasals, length 13·5, breadth anteriorly 7, posteriorly 3·9; interorbital breadth 10; breadth across brain-case 16·1; posterior breadth on lips of meatus 26·3; palatilar length 21·6; upper tooth-series 8·8; diagonal diameter of  $p^4$  3·5, of  $m^1$  3·3.

*Hab.* Tucuman. Type from Tapia, about 20 miles north of Tucuman City. Alt. 600 m.

*Type.* Adult male, with basilar suture closed. B.M. no. 2. I. 5. 13. Collected 28th October, 1901, by L. Dinelli. Presented by Oldfield Thomas. One specimen only.

This species is no doubt most closely allied to its geographical neighbour *C. tucumanus*, but, as may be seen above, differs both in colour and in quite a number of cranial characters as compared with a set of five good examples of the older-known species.

#### *Ctenomys pontifex*, sp. n.

A medium-sized species without special markings, the bullæ very narrow.

Size about as in *C. latro*. Colour above uniform drab-brown without darker markings; below paler and more buffy. Tail brown above for its whole breadth, whitish below.

Skull rather narrow, the zygomata not widely expanded. Nasals long, nearly parallel-sided, slightly surpassed behind by the premaxillary processes. Brain-case scarcely ridged. Zygomata with the median ascending process rather farther back than usual, the orbital fossæ therefore proportionally large as compared with the temporal fossæ. Mesopterygoid fossa narrow. Bullæ long, low and narrow, in marked contrast to those of *C. mendocinus*, more like those of the otherwise very different *C. frater*.

Incisors and cheek-teeth normal,  $p^4$  of scarcely greater diameter than  $m^1$ .

Dimensions of the type (measured on skin):—

Head and body 183 mm.; tail 77; hind foot 34.

Skull: approximate condylo-incisive length 44; zygomatic breadth 26·5; muzzle, breadth anteriorly 9·8, between antero-orbital foramina 8; nasals, length 18, breadth anteriorly 7,

posteriorly 6·2; interorbital breadth 9·5; breadth across brain-case 17·8; palatilar length 21; upper tooth-series 10; diagonal diameter of  $p^4$  3·6, of  $m^1$  3·5.

*Hab.* "East side of the Andes near Fort San Rafael, Province of Mendoza."

*Type.* Adult female. B.M. no. 60.1, 5.2. Collected by Mr. T. Bridges. Presented by G. R. Waterhouse.

Mr. Bridges collected in this region a number of tuco-tucos which have hitherto been assigned to Philippi's *Ctenomys mendocinus*\*, but I now find that they belong to two quite distinct species—the one with normally inflated rounded bullæ and the other with very narrow ones. Now it fortunately happens that the Museum contains a series of mammals purchased of Gerrard in 1873 which were labelled with Philippi's names in what I believe to be his handwriting, and among them is a tuco-tuco from "Mendoza" labelled *Ct. mendocinus*, which, in the absence of other evidence, we may accept as typical. This specimen has the full rounded bullæ usual in the genus, and I therefore describe as new the one with the narrow bullæ.

## VI.—*Protoëchinus* Austin.

By F. A. BATHER, D.Sc., F.R.S.

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[Plate II.]

### PREVIOUS HISTORY.

IN December 1860 Fort-Major Thomas Austin published in 'The Geologist' (iii. pp. 446-448) a paper "On a new Genus of Echinoderm, &c." This was *Protoëchinus*, so called because its author believed it to be "one of the first, if not the very first true echinus, that appeared on our globe."

The Genotype was the unique species *Protoëchinus anceps*, of which three specimens had been "found in the lower beds, but not the very lowest, of the Carboniferous Limestone [Lowest Tournaisian], at Hook Point, county of Wexford," Ireland. One of these specimens "fell into unscientific hands, and was lost to science." Another was imperfectly preserved. Of the third a rough woodcut was given, and it is this which must be regarded as the Holotype.

The Holotype is No. 401 of the Austin Collection in the

\* Arch. f. Nat. xxxv. p. 38 (1869).

Liverpool Museum. It is the only specimen now known, and I am greatly indebted to Dr. J. A. Clubb for allowing me to borrow it for detailed study.

I have little doubt but that the *Echinocrinus anceps* of T. & T. Austin (*nom. nud.*, Oct. 1842, Ann. & Mag. Nat. Hist. x. p. 111, and brief description, Mar. 1843, Ann. & Mag. Nat. Hist. xi. p. 207) refers to the same specimen, although Dr. R. T. Jackson, in his admirable "Phylogeny of the Echini" (Jan. 1912, Mem. Boston Soc. Nat. Hist. vii.\*) twice mentions it as a distinct species (pp. 449, 454). The Austins' description being in the form of a comparison with the undescribed *E. pomum* is a case of *ignotum per ignotius*, but the specimen is said to be "a fragment showing the internal structure of the ambulacra and a few of the adjoining plates," and this fully agrees with our holotype. Moreover, no other specimen agreeing with this statement is in the Austin collection or represented in the Austins' unpublished drawings. It will be remembered that the Austins originally regarded *Echinocrinus* (= *Archaeocidaris*) as a possible Crinoid, partly no doubt because some of their Carboniferous echinoid specimens had crinoid stems accidentally lying just over their oral or apical poles. Consequently *Protoechinus* or *Echinocrinus anceps* appears with the other Echinocrini from Hook Point on the sketch for a plate of the unfinished Crinoid Monograph.

The essential clauses in Austin's description (1860) are: "Ambulacral areas wide; the two rows of pores in double pairs near the margin, with alternate additional perforated plates near the widest spread of the ambulacra; where these additional plates intervene the pores become quadruple; interambulacral areas wide." The word "quadruple" can only mean that where there are four columns of ambulacrals there are four double pores in a transverse row. Neither Lovén (1874), nor Zittel (1879), nor Pomel (1887) seem to have understood this, and they ascribed to the genus only three columns of ambulacrals. But if the phrase receive the preceding interpretation, which agrees with that of R. T. Jackson (1912), then the description is correct so far as it goes. The same cannot be said for Austin's figure. Neither takes us very far, and though Duncan (1889) ventured to refer the species to *Palaeëchinus*, and Lambert & Thiéry (1910, p. 120) to *Melonechinus*, most writers have agreed that "with present knowledge . . . this interesting

\* In this work the various references to other authors are given in detail, which is therefore not repeated here.

type . . . . cannot be definitely located" (Jackson, 1912, p. 454).

Examination of the actual specimen would at any time have enabled these distinguished authorities to come to a more definite or more correct conclusion, and now that I have succeeded in removing more of the matrix, it is possible to give a fuller account than might have been anticipated.

#### DESCRIPTION OF HOLOTYPE.

The fragment, which is of roughly triangular shape, 73.5 mm.  $\times$  41.5 mm., lies on a matrix of dark shaley limestone, and is, or was, in part covered by the same. This matrix contains numerous fragments of crinoids, a plate of *Palaeëchinus*, some brachiopod spines, and bits of Polyzoa.

The portion of test preserved is viewed from the inner surface.

As represented in Austin's text-figure and in Plate II. given herewith, the truncated apex of the triangle occupies the peristomial region. Here there meet the adoral portions of two ambulacral areas (B, D), enclosing part of an interambulacrum (C). The accompanying text-figure (p. 48) gives the outlines of the component plates, and the areas are lettered in arbitrary fashion A to D. Of the interambulacral area A, only two fragmentary plates are preserved.

The Imbrication, as may be seen in the photograph, affects both ambulacrals and interambulacrals, especially the former. It follows the normal plan: an adoral overlap for ambulacrals; an aboral and adradial overlap for interambulacrals, which also cover the edges of the ambulacrals. The imbrication of both is strong.

Interambulacrum C begins with the primordial plate in the basicoronal row, about 5.5 mm. long and wide. It is succeeded in the second row by two plates. In the third row appears a space for the initial plate of column 3, but there is some disturbance at this point, and either the plate has in whole or part been overturned so as to expose its outer surface, or an interambulacral from the dorsal region has been forced down upon it; it will be seen in the photograph that the outer margin of this plate on the left passes over the edge of the adjacent plate in column 2 instead of under it, as would be its normal position. That the initial plate of column 3 did occupy this space is proved by the existence of four plates in the fourth row. In the next row appears the initial plate of column 5. Immediately below this in the drawing are seen portions of what appear to be

two plates. Of these the one to the right, over which the dotted line 5 passes, is turned up at the edge next the spectator, but it must be a part of the second plate in column 5. The small portion underlying it to the left may be a part of the same plate in its normal position, or it might possibly belong to the initial plate of column 6. The outwardly splaying curves of the ambulacra just here render the existence of a sixth column almost inevitable.

Of these columns of interambulacra, No. 1 is the least disturbed. It consists of five plates, all, except the primordial, higher than wide and relatively thin; the third plate measures 8.2 mm.  $\times$  4.5 mm., so far as visible. Towards the peristomial margin the plates of this and of column 2 increase in thickness, and the primordial plate itself is fairly stout. The adradial edges of this plate, instead of being merely bevelled off, are marked on each side with two curved notches to receive the ambulacra; and this confers greater rigidity on the peristomial frame. The edges of the adoral pair of notches are raised. The adoral margin of the plate seems incomplete, and adoral to it a fragment of some plate is seen in the matrix.

The plates of column 2 as represented in the drawing do not seem to tally with the corresponding plates of column 1. It is, however, difficult to see the suture between the second and third plates, and these may really be but a single plate.

The plate at the beginning of column 3 displays part of the outer surface, and this is covered with small secondary tubercles. A primary tubercle, if borne by the plate, is not seen on this exposed part.

The initial plate of column 5 bears a circular depression with central elevation, and this may be caused by the pressure of a scrobiculate primary tubercle on its underlying outer face.

Of the Ambulacra, B is the better preserved. The notches in the primordial interambulacral indicate that the first of the coronal ambulacra has been removed. Reckoning this, we note in this column *a* five ambulacra stretching to the perradius and alternating with five of the adjoining column *b*. Their width increases from 7.6 mm. to 8.9 mm. These are succeeded by a row of four ambulacra, and then, oddly enough, the next row consists of only two very wide plates (*a* being 9.2 mm. wide). After this the succession of four columns reappears and, so far as can be seen, continues regularly (*a*, *a'*, *b'*, *b*).

In the right half of Ambulacrum D there was likewise a series of five plates before the column divided into two. In

the third row of double plates there is some irregularity, suggestive of a change to three columns instead of two; but this does not seem to continue, and probably should be regarded as an accidental abnormality.

The inner surface of the ambulacrals is divided into two fields by a transverse elevation, which arises gradually at the outer end (next the interradius), but becomes more prominent at its inner end where it bends round to meet the corresponding ridge of the adjacent ambulacral in the next column. These ridges are stouter in the ambulacrals nearer the peristome, and in ambulacrum B those of column *a* are seen bending adapically so as to meet the adorally bending ridges of the plates in column *b*. This increased stoutness of the ambulacrals and the apposition of their ridges afforded additional support to the peristomial frame.

May we not see here the beginnings of a regular perignathic girdle? The low ridges bordering the adoral notches of the primordial interambulacral suggest incipient apophyses, and these elevations of the adoral ambulacrals may have served for the attachment of the retractor muscles. They are conspicuous structures even in the fossil, where they are broken, but in a perfect specimen they would have been still more conspicuous. The auricles of later echinoids are separated from the ambulacrals on which they rest by a suture, but these processes are part of the ambulacrals. That, perhaps, does not forbid the hypothesis of their subsequent separation. If, as in *Lepidesthes* (Jackson, 1912, pl. 68. fig. 3), the ambulacrals flowed down on to the peristome, then the attachment of the retractors must have kept moving from the processes of one row of plates to those of the succeeding row. So awkward an arrangement may have been superseded by the separation of the processes and their conversion into true auricles. It is hard to believe that the auricles originated later as independent elements, and the suggestion that they were modified from pre-existing subambulacral elements (*e. g.*, floor-plates) does not appear to me to be supported by adequate evidence from the fossils.

From the transverse ridge the ambulacral plate slopes to its adapical margin, which is flattened out in a slight flange-like rim. On the other side the plate slopes to its adoral margin, passing under the next plate (as seen from the inside).

The Ambulacral Pores lie on the adoral side of the transverse ridge, a little to the outer side of the median meridional line of the plate. They appear in many cases to be very close to the adoral margin of the plate; this, however, is

largely due to the imbrication of the ambulacrals. If the same plates were viewed from the outside the pores would in any case not be so near the edge; but, further than this, the pore-canals slope slightly from inside to outside in an adapical direction, so that they would have opened on the outside still nearer the middle transverse line of the plate. The pore-pair opens on the inside at the bottom of a slight depression, one side of which forms part of the transverse ridge. The long axes of these internal peripodia lie at an angle to the perradius, the inner pore being more adoral in position than the outer. The adradial end of the peripodial rim is depressed, presumably for the passage of the side-branch from the radial water-vessel which passed to each pore-pair behind the transverse ridge of the adjoining oral ambulacral. In the case of the two or three ambulacrals nearest the peristome this passage is quite arched over by the above-described processes; and it looks as though the radial vessel were also covered by these processes when they were complete. This latter arrangement increases the resemblance of the processes to auricles, and suggests that in serial sections obtained by grinding down such a fossil embedded in matrix the processes, especially if broken, might possibly be interpreted as floor-plates.

A few Radioles are preserved on both faces of the specimen. The evidence that they belonged to this individual is inconclusive, but they are of a character consonant with that view. The one shown just above the numeral 4 in the text-figure is probably a primary radiole. It is 4.3 mm. long, has a slightly enlarged base, and is almost smooth, with traces of longitudinal fasciculate micro-structure. It closely resembles, except in its smaller size, the primary radiole of *Pholidocidaris irregularis* (Jackson, 1912, pl. 75. fig. 5). The other fragments are rather thinner, but show the longitudinal striation more plainly; they belong probably to secondary radioles.

The minute Structure of the Stereom is visible under a strong lens on several of the plates. In the ambulacrals it is rather coarser and quite irregular. In the interambulacrals it is finer, with the meshes arranged in regular, though not necessarily straight, rows.

#### SYSTEMATIC POSITION.

Following the Classification of R. T. Jackson (1912), and using his Key (pp. 201-208), we note that the number of columns of ambulacrals and interambulacrals, their strong

imbrication, and the retention of the primordial interambulacral in the basicoronal row, place the specimen without doubt in the *Lepidesthidae*.

The number of ambulacral columns removes it from *Lepidechinus* and *Perischodomus*, which have only 2; also from *Lepidesthes* with its 8 columns, and from *Meekëchinus* with 20. *Perischocidaris* has 6 columns, a number which might conceivably, though improbably, have been attained by *Protoëchinus anceps*; but the structure of both ambulacrals and interambulacrals is quite different. *Proterocidaris* has only 4 columns of ambulacrals, but, on the other hand, it has "many more columns of interambulacral plates than are known in other genera of this family," certainly very many more than in *Protoëchinus* and of quite different character.

Of described genera there remains only *Pholidocidaris*. According to Dr. Jackson's Key this has 4 to 6 ambulacral columns, 5 to 6 interambulacral columns; plates strongly imbricating; adoral ambulacrals much larger than those of the adapical region. In the account of the genus on p. 433 it is added that the interambulacrals are large and scale-like. All this agrees well with Austin's specimen, which, if not actually a *Pholidocidaris*, is at any rate "near to" it, as Dr. Jackson himself (*in litt.*) concluded on the evidence of a cast which I sent to him.

It is, however, not clear why Dr. Jackson assigns a possible four columns to the ambulacral area of *Pholidocidaris*, considering that in *P. gaudryi* and *P. irregularis* there are six columns; it is only in the dorsal (adapical) region of an immature individual of the latter species that four columns are noted, and there may have been more at the ambitus. The ambulacral areas are unknown in *P. tenuis* and *P. acuaria* (Whidborne, sub *Protocidaris*). Even if all other species of *Pholidocidaris* had six columns to the area, while *Protoëchinus anceps* had only four, this would not of itself be enough for generic distinction.

Apart from this, *P. anceps* differs from *P. irregularis* Meek & Worthen in the regular succession of its interambulacral columns (though the irregularity observed in a specimen of the latter species may be individual only), and in the apparent differences of size between the various interambulacral plates, those in the adoral region of *P. irregularis* being "of about the same size" (Jackson). In *P. irregularis* the pore-pairs of the adoral region are "about in the middle of each plate"; vague though this statement is, I scarcely think that Dr. Jackson would have applied it to *P. anceps*.

From *Pholidocidaris tenuis* Tornquist, known only from



scattered plates, *P. anceps* differs in the less regular shape and less width, both relatively and absolutely, of its interambulacral plates; also in the less height, relatively and absolutely, of its ambulacrals. It is worth noting here that Jackson has referred to *P. tenuis* a specimen from Coplaw, Clitheroe (Mus. Pract. Geol., 16,304).

*Pholidocidaris acuaria* (Whidborne) is so imperfectly known that no comparison is possible; but since it comes from the Upper Devonian (Pilton Beds) it is unlikely to be the same species as *P. anceps*.

*Pholidocidaris gaudryi* Julien is also known only from fragmentary imprints of plates and radioles, which cannot be compared. The possession of six ambulacral columns seems, however, to constitute a difference.

#### CONCLUSION.

*Protoechinus anceps* may therefore be referred to the family *Lepidesthidae*, genus *Pholidocidaris*.

Since Austin's description has proved to be quite unrecognizable, the name *Protoechinus*, though of earlier date, cannot possibly supplant *Pholidocidaris* Meek & Worthen, 1869.

If the specimen could be proved to belong to any species of *Pholidocidaris* hitherto described, the name *anceps* also would have to give way. Since, however, it appears to be specifically distinct I propose to retain the name, denoting the species as

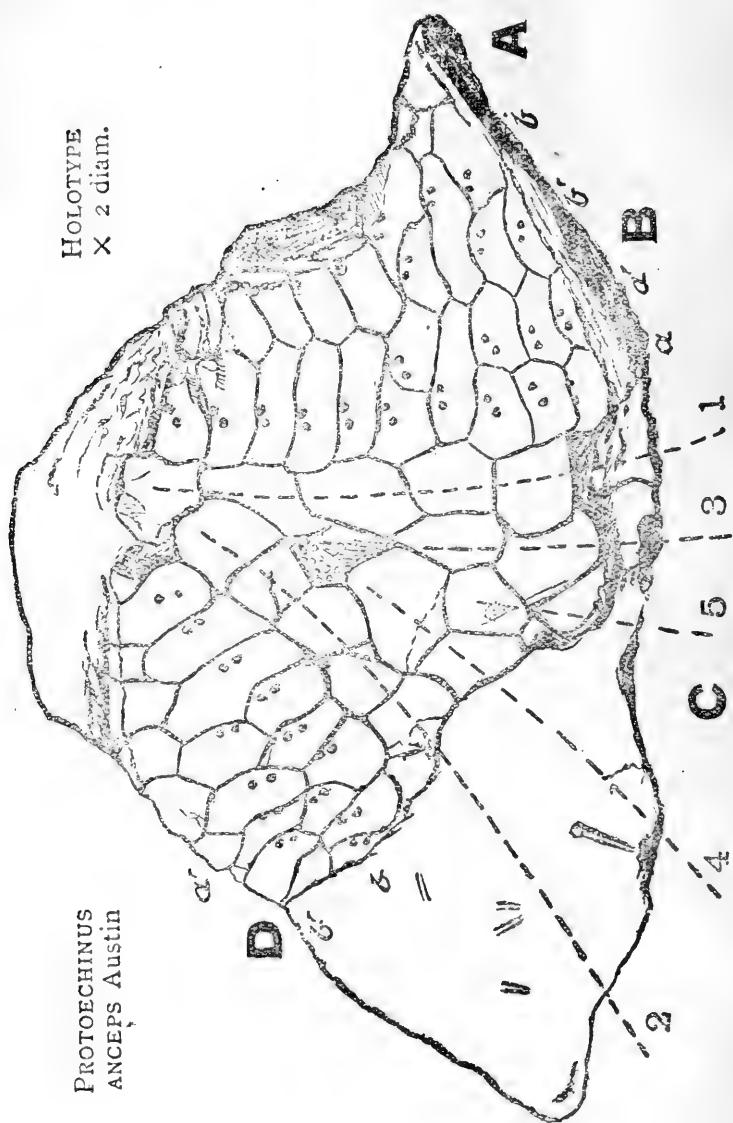
#### *Pholidocidaris anceps*.

**Diagnosis.**—A *Pholidocidaris* with 4 columns to the ambulacral area; adoral ambulacrals of both the double and the quadruple series more than twice as wide as high, fairly stout, with pore-pairs outside the median meridional line and oral of the median transverse line, sloping from the perradial end in an adapical direction, with 5 (? 6) columns to the interambulacral area; adoral ambulacrals thin, irregular in outline, but width not more than  $2/3$  height, except in the primordial plate, which is about as wide as high.

This diagnosis, being based only on the internal surface of the adoral region, is of course incomplete. The real interest of the specimen lies in its structural features.

#### EXPLANATION OF PLATE II.

The Holotype of *Pholidocidaris anceps*, from a photograph by Herbert G. Herring, enlarged to two diameters. The unnatural appearance of the shadow below the specimen is not due to Mr. Herring's excellent photograph.





PROTOECHINUS ANCEPS.



## VII.—Notes on the Braconidæ in the British Museum.—

## II. On the Australian Species of Cardiochilinae and Doryctinae. By ROWLAND E. TURNER, F.Z.S., F.E.S.

Subfamily *CARDIOCHILINÆ*, Ashm.Genus *CARDIOCHILES*, Nees.*Key to the Australian Species.*

♀ ♀.

- |   |                                |
|---|--------------------------------|
| 1. Hind metatarsus distinctly broadened, not cylindrical; head and abdomen black, the basal abdominal segment sometimes reddish ..... | 2.                             |
| Hind metatarsus cylindrical; head and abdomen mostly red or fulvous .....   | 3.                             |
| 2. Thorax and abdomen entirely black .....  | <i>C. assimilator</i> , Turn.  |
| Thorax and basal abdominal segment red....  | <i>C. dissimulator</i> , Turn. |
| 3. Vertex entirely black .....  | <i>C. verticalis</i> , Turn.   |
| Vertex red or fulvous .....   | 4.                             |
| 4. Wings strongly infusate on the apical third; costa and basal half of stigma yellowish .  | <i>C. rufator</i> , Roman.     |
| Wings uniformly subhyaline; costa and stigma fuscous, a yellowish spot at the base of the stigma .....                                | <i>C. uniformis</i> , Turn.    |

*Cardiochiles assimilator*, sp. n.

♀. Nigra; femoribus anticis apice, tibiis anticis subtus, tarsisque anticis et intermediis, unguiculis exceptis, albido-brunneis; calcaribus albis; alis fusco-hyalinis, tertio apicali fuscis, stigmatе venisque nigris; mandibulis fusco-ferrugineis.

♂. Feminae similis, tarsis intermediis nigris; alis fuscis unicoloribus.

Long. 5 mm.

♀. Head nearly as broad as the thorax; antennæ 37-jointed, the second joint of the flagellum distinctly longer than the third. Vertex and face shining, minutely punctured, the cheeks a little shorter than the breadth of the mandibles at their base. Thorax minutely punctured, shining, the notauli crenulated. Pubescence white, long, and rather close on the sides of the scutellum and on the dorsal surface of the median segment; the enclosed area of the median segment ovate, rather narrow, the longitudinal

carina on each side further at the base from the enclosed area than from the lateral margin of the segment. Abdomen smooth and shining; sheath of the ovipositor short and broad, subtruncate at the apex, scarcely one-third of the length of the abdomen. Hind metatarsus somewhat broadened, especially at the base, not cylindrical. Neuration as in *C. saltator*, Fabr., but the distance between the nervulus and the basal nervure is only one-quarter of the length of the first discoidal cell on the discoideus, not one-third as in *saltator*.

*Hab.* Kuranda, N. Queensland (*Turner*), May 1913; Mackay, Queensland (*Turner*) (type), March to May 1900, August 1891.

The wings are hyaline on the basal half in the specimen from Kuranda. This species is very nearly related to *C. fuscipennis*, Szép., and *C. fasciatus*, Szép., from New Guinea, and may prove to be only a race of one of them, but the descriptions are very brief. *C. piliventris*, Cam., and *C. trichiosoma*, Cam., from Waigiou, are also very closely related.

*Cardiophiles dissimulator*, sp. n.

♀. Nigra, thorace, segmento mediano, segmento que dorsali primo area mediana rufis; clypeo, mandibulis, apice excepto, palpis apice, femoribus anticis apice, tibiis anticis, tibiis intermediis subtus et basi, tarsisque anticis et intermediis ferrugineis; calcaribus albidis; alis hyalinis, apice ad medium stigmatis fortiter infuscatis, venis nigris.

Long. 5 mm.

♀. This is very similar to the last species, except in colour, and may possibly be a variety, but the sheath of the ovipositor is distinctly shorter, being scarcely more than one-quarter of the length of the abdomen, and the enclosed area on the median segment is a little broader and distinctly rhomboidal. The pubescence on the dorsal surface of the median segment and the sides of the scutellum is much shorter and more sparse. The antennæ are 37-jointed.

*Hab.* Thursday Island, Queensland (*Turner*), May 1902.

In all Australian species of the genus here described the radius beyond the second transverse cubital nervure and also that nervure itself are only indicated, not fully developed as in the European *C. saltator*, Fabr. This condition, however, appears to be common in the genus, *C. saltator* seeming to be rather exceptional.

*Cardiochiles verticalis*, sp. n.

♀. Fulva; antennis, vertice latissime, segmento dorsali sexto macula apicali, valvulis terebræ, tibiis posticis apice extremo, tarsis posticis, unguiculisque nigris; alis flavo-hyalinis, apice ad medium stigmatis fortiter infuscatiss, venis basi flavis, apice infuscatiss.

Long. 6 mm.

♀. Head distinctly broader than the thorax, not narrowed behind the eyes, distinctly narrowed anteriorly, face minutely and not very closely punctured; cheeks a little more than half as long as the breadth of the mandibles at their base. Antennæ 41-jointed, stout, setaceous, second joint of the flagellum shorter than the scape and no longer than the third joint. Notauli deep and smooth; median segment finely rugulose, with an enclosed ovate area in the middle, on each side of which, halfway to the lateral margin of the segment, is a longitudinal carina. Abdomen almost smooth, the punctures microscopic; the sheath of the ovipositor nearly half as long as the abdomen, deflexed, broadened, obliquely truncate at the apex. The nervulus is received much nearer to the basal nervure than in *saltator*, Fabr., or *rufator*, Roman, the distance between them being scarcely more than one-fifth of the lower margin of the first discoidal cell.

*Hab.* Mackay, Queensland (*Turner*), January 1900.

This is near *rufator*, Roman, but the colour-differences are considerable, and the ovipositor seems to be longer, and the comparative length of the basal joints of the antennæ is different. The male has the apical half of the hind femora, the hind tibiæ, except a spot at the base, and the hind tarsi black.

*Cardiochiles uniformis*, sp. n.

♀. Fulva; mandibulis apice extremo, antennis, mesosterno apice, segmentis dorsalibus quarto, quinto, sextoque macula mediana, valvulis terebræ, tibiis posticis apice, tarsis posticis incisuris fulvis, unguiculisque nigris; mesonoto fasciis longitudinalibus 4 brunneis; alis pallidissime fusco-hyalinis; stigmatibus fuscis, basi macula parva flava; venis fuscis, apice pallidis.

♂. Femiinæ similis; vertice fascia lata curvata utrinque circum ocellos, mesonoti fasciis, segmento septimo dorsali macula mediana nigris.

Long. 5 mm.

♀. Head a little broader than the thorax, minutely and not very closely punctured, cheeks about as long as the breadth of the mandibles at their base. Antennæ setaceous, second joint of the flagellum as long as the scape, a little longer than the third joint; 35 joints in the antennæ in both sexes. Notauli smooth at the base, distinctly crenulated posteriorly; dorsal surface of the median segment very feebly rugulose, occupied by a very broad cordiform area. Abdomen smooth and shining; sheath of the ovipositor truncate at the apex, broadened from the base, about one-third of the length of the abdomen. Nervulus separated from the basal nervure by a distance not exceeding one-fifth of the length of the first discoidal cell on the discoideus.

*Hab.* Mackay, Queensland (*Turner*), February to April 1900.

There is much variation in the size and intensity of the black marks on the vertex and mesonotum in both sexes, the female occasionally having a small spot on each side close to the posterior ocelli and the male often having the vertex entirely fulvous. The female has the marks on the mesonotum either black or brown. This seems to be closely allied to *C. rufator*, Roman, differing in the colour of the wings, the position of the nervulus, and the number of joints in the antennæ. The latter character may vary.

*Cardiochiles rufator*, Roman.

*Cardiochiles rufator*, Roman, Arkiv f. Zool. ix. 9, p. 17 (1915).

*Hab.* Kimberley, N.W. Australia.

I have not seen this species.

The species with cylindrical hind metatarsi would come into Cameron's genus *Ernestiella*, which was formed for the Ceylon species *nigromaculata*, Cam., which is closely allied to the Australian species, but I cannot regard the distinctions as of generic importance. Cameron himself some years after publishing the name *Ernestiella* described an allied Indian species as *Cardiochiles fulvus*. I consider that *Schönlandiella*, Cam., founded on a South African species, is also a synonym of *Cardiochiles*.



## Subfamily DORYCTINÆ.

*Key to the Australian Genera of the Doryctinæ.*

1. Hind coxæ with a long spine; parapsidal furrows obsolete; a strongly curved nervure springing from the apical angle of the mediellian cell and dividing the discoidellian cell ..... *Liodoryctes*, Szép.
- Hind coxæ unarmed; parapsidal furrows well developed; discoidellian cell not divided by a curved nervure..... 2.
2. Pronotum armed with an upright spine on each side, the first and basal area of the second tergite longitudinally striated .. *Acanthodoryctes*, Turn.
- Pronotum unarmed; basal tergite longer than broad, sparsely punctured; second tergite smooth ..... *Syngaster*, Brullé.

*Key to the Species of Liodoryctes.*

♀ ♀.

1. Second tergite smooth; mesonotum reddish. 2.  
Second tergite finely longitudinally striated on the basal area; mesonotum black .. *L. nigrodorsalis*, Turn.
2. Ovipositor very distinctly shorter than the abdomen; median segment black..... *L. erythrothorax*, Turn.
- Ovipositor at least as long as the abdomen, median segment reddish..... 3.
3. Head yellowish red ..... *L. australiensis*, Szép.
- Head black ..... *L. atriceps*, Turn.

*Liodoryctes nigridorsalis*, sp. n.

♀. Fulvo-brunnea; mandibulis apice, antennis, pronoto, mesonoto, scutello, propleuris, mesopleuris, tarsis articulo apicali, trochanteribus intermediis subtus, coxisque posticis nigris; capite, segmento mediano, abdomine subtus, segmento dorsali primo, segmentoque dorsali secundo lateribus flavis; alis fusco-hyalinis, basi flavidulis, venis fusco-ferrugineis, stigmatibus flavo; terebra abdomine paullo longiore, nigra.

Long. 9 mm., tereb. long. 5 mm.

♀. Face below the base of the antennæ rugulose; front shallowly concave between the anterior ocellus and the base of the antennæ. Thorax smooth and shining; median segment covered with very large punctures. First tergite more than half as broad again at the apex as long, irregularly and

finely longitudinally striated, with punctures between the striæ in the middle; curved basal area of second tergite finely longitudinally striated, the apex almost smooth. Ovipositor longer than the abdomen by about one-fifth. Intermediate tarsi a little shorter than the tibiæ; hind coxæ with two spines, the basal one long and whitish, the apical one very small and black.

*Hab.* Port Darwin (Turner), December.

Differs from *australiensis*, Szép., in the colour of the thorax, in the much more extensive striation of the first tergite, in the striation of the basal area of the second tergite which is wholly smooth in *australiensis*, and in the colour of the stigma.

*Liodoryctes erythrothorax*, sp. n.

♀. Flavidula; mandibulis apice, antennis, prothorace, segmento mediano, segmentis dorsalibus quinto sequentibusque, terebræ valvulis, coxis intermediis posticisque, trochanteribusque posticis nigris; mesothorace, scutello, postscutello, maculaque basali segmenti mediani rufis; alis fusco-hyalinis, venis basi fuscis, apice testaceis; stigmatе testaceo, margine costali late fusco; terebra ferruginea.

♂. Feminæ simillimus.

Long., ♀ 9-10 mm., ♂ 6 mm.

♀. Very similar to *australiensis*, differing in the shorter ovipositor, which is distinctly shorter than the abdomen, in the colour of the thorax and median segment, and in the wholly black spine of the hind coxæ.

♂. The whole second tergite is closely and finely longitudinally striated; the first tergite less regularly striated, with punctures intermingled, but more distinctly striated than in the female; the apical tergites very closely and finely punctured. The apical half of the spine of the hind coxæ is yellow. The wings are paler than in the female, the stigma almost entirely dull testaceous.

*Hab.* Mackay, Queensland (Turner), January and February.

*Liodoryctes atriceps*, sp. n.

♀. Ferruginea; capite, coxis intermediis posticisque, tarsis articulo apicali, segmentis dorsalibus tribus apicalibus, valvulisque terebræ nigris, pedibus intermediis posticisque fuscis; abdomine brunneo, subtus flavo, segmento dorsali primo basi, segmento secundo

lateribus flavis; alis pallide fuscis, stigmatibus venisque nigris; terebra abdomine paullo longiore.

Long. 11 mm.; terebræ long.  $5\frac{1}{2}$  mm.

♀. Very similar to *australiensis* and *erythrothorax*, differing from both in the black head and in the more distinct longitudinal striation of the first tergite. The spine of the hind coxæ is pale, not black as in *erythrothorax*.

*Hab.* Mackay, Queensland (*Turner*).

### *Liodoryctes australiensis*, Szép.

*Acanthobracon australiensis*, Szép. Termes. Füzetek. xxv. p. 48 (1902). ♂.

*Neotrimorus australiensis*, Szép. Wytsman's Genera Insect. xxii., Braconidæ, p. 64 (1904).

*Liodoryctes australiensis*, Szép. Ann. Mus. Nat. Hungar. iv. p. 599 (1906).

This species is variable in colour, the tergites are usually fulvous brown, with the basal segment and sides of the second pale yellowish, but in a specimen taken by me at Kuranda in May 1913 the brown is replaced by black. Ovipositor distinctly longer than abdomen.

*Hab.* Cooktown (*D. Le Souef*); Kuranda and Mackay (*Turner*).

### Genus ACANTHODORYCTES, gen. nov.

Front strongly concave between the anterior ocellus and the base of the antennæ; pronotum depressed, armed with two spines; basal half of the scutellum depressed and coarsely striated; first tergite as broad at the apex as long, coarsely longitudinally striated, second tergite punctured-striate on the rounded basal area; second abscissa of the radius about twice as long as the second transverse cubital nervure; radial cell of hind wing not divided, discoidellian cell not divided. Ovipositor nearly as long as the abdomen.

### Key to the Species of Acanthodoryctes.

1. Spines of the pronotum strong, upright, and acute; median segment covered with close-lying hairs, without carinæ on the basal half; head yellow ..... *A. morleyi*, Frogg.
- Spines of the pronotum reduced to tubercles;

median segment without close-lying hairs,  
 with two strong carinæ from base to apex;  
 head black ..... *A. gilberti*, Turn.

Type of the genus, *Iphiaulax morleyi*, Frogg.

*Acanthodoryctes gilberti*, sp. n.

♀. Rufo-testacea; capite pedibusque nigris; segmento dorsali primo pallide flavo; segmentis ventralibus albidis, lateribus nigro-marginatis; alis fuscis, venis nigris, stigmate fusco-ferrugineo.

Long. 8 mm.; terebræ long. 3 mm.

♀. Face finely punctured, sparsely clothed with long cinereous hairs. Pronotum slightly concave, margined, with a short carina from the hind margin to the middle, a small acute tubercle on each side; parapsidal furrows distinct. Postscutellum with three strong longitudinal carinæ; median segment with two strong longitudinal carinæ from base to apex. First tergite about as broad at the apex as long, coarsely longitudinally striated, the sides with a deep broad longitudinal groove between carinæ, two longitudinal carinæ from the base converging towards the apex, the apical half of the segment with short irregular longitudinal striæ; second suture distinct; second tergite with a broadly rounded basal area, which is longitudinally striated at the base, punctured at the apex. Sheath of the ovipositor black. Second abscissa of the radius a little less than twice as long as the second transverse cubital nervure.

*Hab.* Mackay, Queensland (*G. Turner*), April.

*Acanthodoryctes morleyi*, Frogg.

*Iphiaulax morleyi*, Frogg. Agricultural Gazette of New South Wales, xxvii. p. 566 (1916). ♀.

♀. This is a larger species than *A. gilberti* and differs much in colour, the head being yellow, the mesonotum, scutellum, and postscutellum ferruginous, the pronotum and pleuræ black; the median segment and three basal abdominal segments brown, the apical segments black; the legs brown, variegated with black. The second abscissa of the radius is more than twice as long as the second transverse cubital nervure; the spines of the pronotum are strong and erect. Median segment punctured reticulate, with two longitudinal carinæ on the apical slope; first tergite almost

as broad at the apex as long, longitudinally striated, with a distinct median carina, and two longitudinal carinæ on the sides, the space between the latter increasing in breadth towards the apex and covered with close-lying yellowish-white hairs. The male has the four basal tergites rugose.

*Hab.* The East Coast of Australia as far north as Townsville, and inland as far as Hermannsburg, Northern Territory.

The South-American genus *Binarea* has a single spine on the pronotum and has the radial cell of the hind wing divided, the sculpture is also very different.

*A. morleyi* was submitted by Froggatt to C. Morley before description, and placed in *Iphiaulax* on his authority.

#### Genus SYNGASTER, Brullé.

Brullé described two species from Australia, *S. lepida* and *S. annulicornis*. The former is a fairly common species in S.E. Australia and Tasmania, and ranges as far north as Townsville. The white median segment and first tergite are very conspicuous. In the typical form the legs are black, but a variety taken by Mr. Froggatt at Narrabeen, N.S.W., has the femora, tibiæ, and tarsi red. I have not seen specimens of *S. annulicornis*, and am doubtful if it belongs to the same genus.

Doubtless other genera of Doryctinæ will be recorded from Australia when larger collections are available.

### VIII.—Further Notes on the Asilidæ of Australia.

By GERTRUDE RICARDO.

FROM small collections of Asilidæ sent me by Mr. C. Gibbons and Mr. Frank Taylor for identification the following descriptions of new species and notes on old species are taken, with the addition of any new material in the Brit. Mus. Coll. The types are almost all presented to the Brit. Mus. Coll. by the kindness of the two above-named gentlemen.

#### *DASYPOGONINÆ.*

*Bathypogon testaceovittatus*, ♂ ♀, Macq. Dipt. Exot., Suppl. v. p. 70, pl. ii. fig. 1 (*Dasygogon*).

Two females from Sydney (C. Gibbons) I believe belong to the above species.

These females agree with the description with the exception of the bristles on the tarsi, which are black, not white as stated by Macquart, but the rounded angle of the anterior branch of the fourth vein emitted from the discal cell is present, though not quite so exaggerated as given in the figure; the white hairs below the first two joints of the antennæ are here more reddish and black. *Forehead* with black bristly hairs. *Thorax* with white tomentum on the testaceous sides. Præsutural bristles three in number—one supraalar, two postalar,—all black, and three or four weak dorso-central bristles on each side, pubescence on dorsum black and numerous. *Scutellum* brown, with grey tomentum and four black bristles on its posterior border. *Abdomen* with two black bristles on each side of the first segment; dorsum with short white pubescence, and the usual circle of spines at apex. Femora and tibiæ with short white pubescence also present on the first joint of the tarsi and partly on the other joints; all the legs with numerous black bristles.

*Bathypogon brachypterus*, Macq. Dipt. Exot. i. pt. 2, p. 160, pl. iii. fig. 3 [*Dasypogon*] (1838); id. Suppl. ii. p. 50 [*Dasypogon*] (1846); Ricardo, Ann. & Mag. Nat. Hist. (8) ix. pp. 151, 152 (1913).

A male and female from Queensland and a female from Sydney have a good many black bristles on the legs, and the four bristles on the scutellum are black, not yellow. Others from Queensland have the pale colour of the legs more yellow than red, and are smaller in size.

This appears to be a rather variable species, differing in size and general appearance.

#### NEODIOCTRIA, gen. nov.

Established for one species from Sydney which has a superficial resemblance to *Dioctria alandica*, of Europe, but is at once distinguished by the shape of the antennæ, which are not situated on a projection, and the first two joints are almost equal in length, in other respects the characteristics of the genus are very similar to those of *Dioctria*, the abdomen is slender. *Wings* large. *Legs* slender and nearly bare. *Scutellum* with no bristles, moustache on face almost confined to the oral margin.

*Neodioctria australis*, ♂ ♀, sp. n.

Type (male) from Sydney in Gibbons Coll.

Type (female) in Brit. Mus. Coll. from Australia, and other males and females in Gibbons Coll., all from Sydney.

A handsome reddish-yellow species with large black spots on the *thorax* and the *abdomen*. *Legs* reddish yellow, the hind pair largely black. *Wings* blackish.

Length, ♂ 15–20, ♀ 15–20 mm.

*Male*.—*Face* brownish, covered with golden-yellow tomentum; moustache consists of yellow bristly hairs round the oral margin and continued above, but not reaching the middle of the face. Beard golden yellow. *Palpi* black, with black hairs and a few reddish ones at apex. *Antennæ* black, longer than the head (depth), the first two joints similar in shape, and almost the same length, with black hairs and bristles below, the third joint longer than the first two joints together, with a short obtuse spine at apex. *Fore-head* black, with a few black hairs. Hind part of head bordered with strong reddish-yellow bristles, collar also with same-coloured longer bristles. *Thorax* reddish yellow, the large black spot covering almost all the dorsum produced anteriorly, so that the shoulders are reddish yellow; there are three præsutural reddish-yellow bristles and two similar supraalar bristles; dorsum almost bare; a few short black hairs are discernible on the median line, on shoulders, and at sides; breast-sides bright reddish yellow, with some yellow tomentum. *Scutellum* same colour, bare, with a very few short black hairs on dorsum. *Abdomen* with a large oblong black spot on each segment forming a stripe, though each spot has rounded angles posteriorly, and the first segment is almost entirely black, its posterior border being reddish yellow at the sides only; underside almost entirely pale yellow. Genitalia small, with black hairs and a few short yellow ones. *Legs* reddish yellow, the hind femora black except at their extreme base, and the hind tibiæ black on the apical two-thirds; tarsi except the first joint chiefly black; the femora are slightly incrassate, bare, with some very short black pubescence; all the tibiæ with reddish-yellow stout bristles and black short pubescence; the tarsi with the same bristles, the hind pair with some black ones. *Wings* blackish grey, veins black, all the cells open, the fourth slightly narrower at border and the anal cell very narrow at border, the small transverse vein at the middle of the discal cell.

*Female* identical, the præsutural bristles one less in number

and the supraalar apparently one more in number; the seventh segment of *abdomen* is entirely yellowish in the type only, the last segment greyish yellow with a fringe of red short spines. The hind tibiae are only black on the apical third in the type only; the small transverse vein of wing is beyond the middle of the discal cell. *Wings* in both sexes with very small alulae, as in species of *Dioctria*.

*Neosaropogon nigrinus*, ♂, sp. n.

Type (male) and three other males from Kuranda, Queensland (F. P. Dodd), and two in Mr. Taylor's Coll. from Queensland.

A handsome species, nearly allied to *N. claripennis*, Ricardo, but distinguished by the darker abdomen, antennae, and tarsi.

Length 18 mm.

*Face* covered with golden-yellow tomentum. Moustache composed of long stout yellowish bristles round the oral opening. *Palpi* black with black pubescence. Beard yellowish. *Antennae* blackish, the third joint nearly three times as long as the first two joints together, ending in an obtuse knob on its lower border at apex. *Forehead* same as face, with black hairs at sides and on ocelligerous tubercle; bristles at vertex round head are black, then yellowish hairs. *Thorax* blackish, the shoulders and sides covered with yellow tomentum, sides with black hairs. Præsutural bristles two in number, stout and long; two supraalar and two postalar bristles, two very stout long dorso-central bristles, and a few short finer ones intermixed; dorsum of thorax nearly bare, a few fulvous hairs are discernible. *Scutellum* with two black bristles, covered with yellow tomentum. *Abdomen* long and slender, blackish, with dull fulvous spots on the sides, and the last three segments are almost wholly reddish yellow; genitalia rather large, black above and reddish yellow below, with long yellowish tuft-like hairs; dorsum with very fine yellowish pubescence, not at all prominent, sides of first segment with yellow hairs and three or four usually reddish bristles; underside of abdomen dark. *Legs* reddish yellow, the fore femora with a broad black stripe on their upper sides, the others with a less well-marked dark stripe; tibiae bright yellow with black apices, and all the tarsi black; femora with long yellow hairs below and short black pubescence on dorsum; tibiae with fringes of yellow hairs at sides and on the pale parts and black pubescence at apex, and



armed with fairly numerous black bristles; tarsi with stout black bristles. *Wings* as long as the abdomen, clear, pale yellowish at the extreme base; veins brown, the first vein from the discal cell bulges moderately into the first posterior cell; the small transverse vein is on the apical third of the discal cell; fourth posterior cell open but very narrow at the border, anal cell the same.

*LAPHRINÆ.*

*Nusa queenslandi*, ♂, sp. n.

Type (male) from Stannary Hills, N. Queensland, circa 3000 feet (*Dr. T. L. Bancroft*), 1909, 145.

The only species of this genus recorded from Australia is *N. tectamus*, Wlk., a large species distinguished by the grey hairs at base of abdomen. This is a blue-black shining species considerably smaller, and the abdomen is bare. Legs with white and black pubescence.

Length 16 mm.

*Face* black, with white tomentum at sides. Moustache consists of stout black bristles, with long white hairs below and white hairs at sides of face. *Palpi* black, with some short reddish hairs at apex. *Antennæ* blackish brown, the first two joints with black hairs below and a strong black bristle on underside of the second joint. *Forehead* with black bristles on the central tubercle and whitish hairs at sides and round head, and one black bristle each side. *Prothorax* armed with a circlet of black bristles. *Thorax* with some sparse black pubescence, shoulders greyish white. *Scutellum* the same, with a fringe of weak black bristles on its posterior border. *Abdomen* with a white spot at the side of the second, third, and fourth segments, two stout black bristles on side of second segment, and one on nearly all the remaining segments, with black hairs at sides and white ones on the pale spots. Genitalia prominent, with black and yellow hairs. *Legs* blackish, with black pubescence, the femora with some white hairs, the tibiæ with chiefly white hairs and with black bristles, the tarsi armed with numerous strong black bristles. *Wings* brownish, paler on posterior border, the first posterior cell closed near the border, fourth and anal cell also closed.

A female or male from Eidswold, Queensland, though much smaller (only measuring 12 mm.), appears to be identical with this male, though the white pubescence on the legs

is not so marked; the end-segment of abdomen being destroyed, it is not possible to determine the sex; the first posterior cell of wing is very narrow, but not absolutely closed.

#### ASILINÆ.

*Dysmachus rudis*, Walker, List Dipt. vii., Suppl. 3, p. 737, 254 (1855) [*Asilus*]; Ricardo, Ann. & Mag. Nat. Hist. (8) xi. p. 422 (1911); White, R. S. Tasmania, p. 172 (1916).

This has been placed in a new genus *Trichoitamus* by the late Mr. A. White, who draws attention to the difference in the ovipositor from *Dysmachus*, the lamellæ being free, not wedged in as in the last-named genus. Owing to the War, Mr. White's paper has not yet been forwarded to this country, but owing to his brother's kindness I have had the MS. to study.

Mr. Gibbons sent me males and females of this species from Sydney. These differ somewhat from the type in the colour of the legs, which are darker, the tibiæ only dull red at the base, not reddish yellow on the basal two-thirds, and the first joint of tarsi is black, not yellow; the whole insect is darker than Walker's type. The female has a short ovipositor, not including the seventh segment, though it is much compressed laterally.

In the Brit. Mus. Coll. a female from Mangalore, Tasmania, presented by A. White, has the legs very similar to those of the type, and the moustache has white hairs below the black ones; in the specimens from Sydney the moustache is wholly black.

*Cerdistus australis*, ♂ ♀, sp. n.

Type (male) and two other males, type (female); all from Sydney. In Mr. Gibbons's Coll.

A small black species distinguished from *Cerdistus maricus*, Wlk., and *Cerdistus sydneyensis*, Schiner, by the entirely black legs in the males. Schiner's species has the wings tinged with grey, which does not appear in this species.

Length 13 mm.

*Male*.—Face blackish brown, with a little white tomentum at sides and below. Tubercle small, with moustache composed of black bristles and some white ones below. Beard

white. *Antennæ* blackish, the first two joints with black hairs. *Forehead* with black hairs. *Thorax* brownish, with grey tomentum and with black stripes, the median one broad, the side ones shorter; dorsum covered with short black hairs and long black bristles posteriorly, one or two are white. *Scutellum* with two white bristles on its outer border. *Abdomen* black, with grey segmentations, those on the second and third segments broadest; pubescence on dorsum black, hairs at sides white and black with white and black bristles; genitalia black, with black hairs and long black bristles. *Legs* black, the fore femora with long white pubescence and bristly white hairs, the middle and hind pair with shorter white pubescence and bristles; fore tibiæ with two long black bristles on outer side and other black and white shorter bristles; pubescence white, rufous on the inside, middle and hind pair with white and black bristles; tarsi with black bristles only. *Wings* clear, small vein beyond the middle of discal cell.

*Female* is identical, but the fore and middle tibiæ are obscurely reddish, and the white bristles of the moustache are rather more numerous; ovipositor nearly as long as the last two segments together.

*Cerdistus sydneyensis*, Schiner, 'Novara' Reise, Dipt. p. 187 (1868).

One male and one female from Sydney, in Mr. Gibbons's Coll.

One male from Hornsby, in Mr. Gibbons's Coll.

This is a small species distinguished by the reddish-yellow bases of tibiæ and femora; the bristles on the legs are largely white, most numerous on the underside of the hind femora; the two bristles on margin of scutellum are black, the bristles on sides of abdomen black.

The type was described as from Sydney.

*Cerdistus maricus*, Walker, Insecta Saunders, Dipt. i. p. 141 (1851); id. List Dipt. Brit. Mus. vii., Suppl. 3, p. 735 (1855); Ricardo, Ann. & Mag. Nat. Hist. (8) xi. p. 436 (1913).

In my description of the above the two weak yellow long bristles on scutellum are present on the specimen from Queensland (a female); in the type (a male) they are black. Another female in Mr. Gibbons's Coll. from Sydney has them yellow.

*Neoitamus gibbonsi*, ♂ ♀, sp. n.

Type (male) in Brit. Mus. Coll., presented by C. Gibbons, 20. 2. 16, from Sydney.

Type (female) from Sydney, and other males and females from the same place and by the same collector.

This species will not belong strictly to this genus, as the ovipositor of the female, though long, does not include the sixth or seventh segment; but, as remarked by the late Mr. Arthur White in his last paper, species from Australia placed in this genus are many of them not typical and may require later to be removed to a new genus peculiar to Australia.

It is a large species nearly allied to my *Neoitamus hyalipennis*, but distinguished from it by the ovipositor not including the seventh segment, by the moustache being wholly black, and the base of the hind femora more or less reddish yellow.

Length, ♂ 16-17, ♀ 18-24 mm.

*Male*.—*Face* with a very large tubercle, blackish with pale tomentum, thickest at the sides. Moustache composed of many short black bristles. *Palpi* black, with white hairs. Beard white. *Antennæ* black, the first two joints and the forehead with black bristly hairs. *Thorax* with the usual stripes very distinct, the middle one not divided and the side ones continued from the anterior border to the posterior border; the præsutural, supraalar, and postalar bristles each two in number; dorso-central bristles numerous, some stout and some hair-like, with short black hairs continued to anterior border rather *Dysmachus*-like. *Scutellum* with at least two stout black bristles, intermixed with finer hair-like ones which also cover the dorsum. *Abdomen* blackish, with some grey tomentum, and the segmentations grey; sides grey; the pubescence on dorsum is thick and black, but short, sides with white hairs. Genitalia long and narrow, longer than the last two segments together, shining black, with short black hairs. *Legs* black, the hind femora reddish at their extreme base, in some of the specimens this colour is extended; the tibiæ reddish yellow for two-thirds of their length; fore femora with long black and white hairs above and below, the others with short black pubescence and black bristles; tibiæ and tarsi with black bristles. *Wings* clear, the small transverse vein almost in the middle of the discal cell, which is very narrow.

*Female* identical. The ovipositor, though not including

the seventh segment, is very long, almost the length of the last four segments.

A male and female from Tasmania seem to belong to this species; the male has some white hairs in the moustache.

*Neoitamus australis*, ♂ ♀, sp. n.

Type (male) and another, type (female) and another; all from Sydney (*C. Gibbons*).

A small species, distinguished from *Neoitamus varius*, Wlk., by the white bristles on thorax and by its lighter colouring. *Legs* reddish yellow, with black streaks. *Moustache* pale yellow.

Length, ♂ 10–11, ♀ 14 mm.

*Male*.—*Face* covered with silky yellow tomentum, tubercle very small. *Moustache* composed of long bristle-like yellow hairs. *Antennæ* blackish brown. *Postocular* bristles pale. *Thorax* covered with yellowish-grey tomentum, the stripes dark blackish brown, the median one broad, not divided, but becoming narrower posteriorly. The præsutural bristles two in number (one black, one white), one supraalar, one postalar, both long and white in colour; dorso-central bristles weak, white, four in number; pubescence on dorsum scanty, black; a median line of hairs from the anterior border extends beyond the suture composed of short but distinct hairs. *Scutellum* with two long white bristles on its margin. *Abdomen* covered with grey tomentum and with a large black spot on each segment; a long yellowish bristle at the side of most of the segments, three longer ones between the fourth and the fifth segments, and yellow hairs intermixed; pubescence on dorsum short, white. *Genitalia* large, black, with black pubescence. *Legs* long, slender, the coxæ black, the femora reddish yellow on their basal halves with the exception of the hind pair, which are black at their extreme base; only the middle and posterior ones have black bristles, and then only few in number; all have some soft hairs below; tibiæ reddish yellow, black at their apices, the tarsi on their anterior joints reddish, then black; tibiæ and tarsi with black bristles. *Wings* grey, the small transverse vein beyond the middle of the discal cell.

*Female* similar. Ovipositor includes only the seventh segment, as in *Neoitamus varius*, which does not include the sixth as stated by me in the *Ann. & Mag. Nat. Hist.* (8) xi. p. 432(1913), and in both species the seventh is only included in a modified degree.

This species will belong to the late Mr. White's subgenus  
*Ann. & Mag. N. Hist. Ser. 9. Vol. i.*

*Rhabdotoitamus*, formed by him for species of *Neoitamus* with the femora striped or partly yellow.

*Ommatius distinctus*, ♂ ♀, sp. n.

Male (type) in Brit. Mus. Coll. from Townsville, Queensland (*F. P. Dodd*), 1904, 284; another in Mr. Gibbons's Coll. from Eidswold, Queensland; another from Kuranda, Queensland (*F. P. Dodd*), in Mr. Taylor's Coll.; and a female (type).

A species distinguished in the male by the dilated wing and by the brown spot on apex of wing, which is absent in the female. Moustache black and white. Legs yellowish, with black stripes.

Length, ♂ 13-14, ♀ 13 mm.

*Male*.—Face with a fairly large tubercle, not, however, very prominent, covered with whitish tomentum. Moustache composed of whitish long bristly hairs and two long black bristles above; in one male there are four of these. Beard whitish. *Antennæ* dull brown, the feathered arista twice as long as the antennæ themselves. Hind part of head with white bristles and white hairs below. *Thorax* blackish blue with grey tomentum; two præsutural bristles, one supraalar bristle, and one postalar bristle, nearly all white; the dorso-central bristles chiefly white; the dorsum almost bare of pubescence. *Scutellum* the same colouring, with two white bristles. *Abdomen* blackish, with grey tomentum and some grey hairs; sides with longer grey hairs. Genitalia rather stout and prominent, black. *Legs* yellowish red, with black stripes on the upper sides of the fore and middle femora, the hind pair with the apical half only, black above; the hind tibiæ black at apex; the last four joints of all the tarsi dusky; the femora all incrassate, the middle pair with noticeable black bristles, the hind pair with four or more white ones, the hind and fore pairs with long fine white hairs below; the fore tibiæ with the same, and the others with shorter white pubescence; the bristles on the legs almost entirely black. *Wings* clear, the anterior border very much dilated in the middle, the veins coalescing and forming a black thick border; the brown spot is at the extreme apex, reaching across the anterior branch of the third vein; the small transverse vein is this side of the middle of the discal cell.

*Female* seems identical, but the black bristles on moustache are more numerous and those on the thorax are largely black, those on the middle tibiæ white. *Wings* at apex are very faintly grey.

IX.—Note on the Lower Jaw of *Stereognathus ooliticus*,  
Charlesworth. By Dr. BRANISLAV PETRONIEVICS.

[Plate III.]

IN 1854 Charlesworth announced the discovery of the fragment of jaw of a new mammal, to which he gave the name *Stereognathus*, and which afterwards, in 1857, Owen described and figured. In 1887 Marsh expressed doubts about the nature of the fragment, suggesting the possibility of its being an upper jaw instead of a lower one, as was held unanimously before\*.

To decide the question, I took, while in London at the end of last year, the specimen from the Museum of Practical Geology, where it is preserved, to the Natural History Museum, where it was further prepared by F. O. Barlow according to my directions.

When I saw the specimen for the first time, and compared fig. 3 of the middle tooth in Owen (1857) with the root of this tooth, I was struck by the inexactness of Owen's figure (fig. 29, pl. i. in Owen, 1871, is better in this respect). Owen's figure shows a longitudinal division of the root, whilst the magnifying-glass shows no trace of such a division, and the root of the other side of the same tooth, now uncovered, confirms this lack of division†. But the newly prepared hindermost tooth shows on the hinder side three distinct roots (comp. Pl. III. fig. 4,  $\alpha$ ,  $\beta$ ,  $\gamma$ ), corresponding to the three longitudinal rows of cusps. So that we have in *Stereognathus* only a transverse division of molar roots.

Pl. III. fig. 1 shows the outer side of the fragment. As its vertical diameter is greater behind than in front, we must conclude that the deeper end is the hind end of the jaw, which, accordingly, is a left one. This state of things was rightly referred to by Owen (comp. Owen, 1857, p. 2), but he

\* Comp. Marsh, O., 1887, p. 343: "None of the known Mesozoic mammals appear to have been truly herbivorous. *Stereognathus*, which has been considered as such, from its molar teeth, cannot fairly be regarded as evidence, since it was based, not upon part of a lower jaw, as described by Owen, but upon a fragment, evidently the posterior portion of the maxillary, and the teeth resemble the superior molars of some insectivorous forms." Comp. also Marsh, 1891, p. 613.

† In his 'Palæontology,' 2nd ed. 1861, p. 345, Owen says expressly: "The outer side of the crown (fig. 115, b), supported by a bifurcate fang which contracts as it sinks into the socket, shews . . ."

hesitated to affirm it categorically. The shaded part below indicates the lower surface of the jaw, which was already uncovered before the new preparation.

Pl. III. fig. 2 shows the newly prepared inner side of the fragment, which sets beyond any doubt that this fragment is a lower jaw. Its lower edge is wholly uncovered in the front part, whilst a narrow band of bone remained covered behind. The --- line shows the position of the lower edge in this hind part in concordance with the lower edge in fig. 1. A faint groove seems to occur in the front part, possibly a trace of the mylohyoid groove.

Pl. III. fig. 3 shows the upper surface of the three molar teeth. It is probable that in front of them there were three more teeth. As the hindmost molar ( $m_3$ ) seems to be somewhat smaller than the middle one, so it is probable that it represents the last molar of the jaw. The valleys between the obliquely placed cones are especially marked in this figure. The grooves between the middle and inner cones of  $m_2$  and  $m_3$ , which are interrupted only where the edges of the oblique valleys meet one another, are marked in the figure as empty spaces. These grooves are clearly distinct from the oblique valleys between the cusps, but narrow in comparison with the cusps.

To the detailed description of the middle tooth by Owen (1857) I must add some corrections. Our fig. 5 (Pl. III.) shows, when compared with fig. 3 of Owen, that there is no such prominent basal cusp on the outer side of this tooth as is marked in Owen's figure\*, and our fig. 6 shows, compared with Owen's fig. 4, that its inner cones are not "slightly inclined forwards" (comp. Owen, 1857, p. 2), as it is quite wrongly indicated by this last figure of Owen. Fig. 7 shows the two middle cusps of this tooth seen from the inner side that have not been figured by Owen. The oblique position of the cusps is quite clearly indicated in this figure. In figs. 5 and 6 the cement that coats the roots is shaded.

I conclude this paper with a remark concerning the probable direction of the motion of lower jaw in *Stereognathus*. According to the mechanical theory of teeth-forms proposed by Ryder and Cope, the oblique position of the molars in some rodents (upwards and forwards for the lower and downwards and backwards for the upper molars) is due to

\* Unfortunately the hinder cusp of this tooth, shown so conspicuously in fig. 3 of Owen, has been broken away since Owen's time.



the motion of its lower jaw from before backwards\*. If this mechanical explanation is a right one, then we may conclude that the oblique position of molar cusps in *Stereognathus* (and probably also in *Meniscoessus*) is due to a motion of its lower jaw from backwards forwards, opposite to the direction in rodents.

Finally, I desire to express my thanks to Dr. A. Strahan and Dr. Kitchin, of the Museum of Practical Geology, and to Dr. Woodward, of the British Museum, for the loan of the new preparation. Also to Dr. Andrews, of the British Museum, for some valuable help.

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3. OWEN, R. 'Palæontology,' 2nd ed. 1861 ("On *Stereognathus*," pp. 345-349).
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5. MARSH, CH. O. "American Jurassic Mammals," in Amer. Journ. Sci. vol. xxviii. 1887, pp. 327-348 (on *Stereognathus*, p. 343).
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8. GOODRICH, E. S. "On the Fossil Mammalia from the Stonesfield Slate," in Quart. Journ. Micr. Sci. vol. xxxv. 1894, pp. 407-432 (on *Stereognathus*, p. 424, with the note of E. Ray Lankester on another lost fragment of jaw of *Stereognathus*).

### EXPLANATION OF PLATE III.

#### *Stereognathus*, Charlesworth.

Fig. 1. The outer side of the fragment of lower jaw, somewhat mutilated in front.

Fig. 2. The inner side of the same; *mg.*, mylohyoid groove.

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\* Comp. Ryder, T. A., "On the Mechanical Genesis of Teeth-forms," in Proc. Acad. Sci. Philadelphia, 1878, especially fig. 8 *b, f*, p. 66, and Cope, E. D., "The Mechanical Causes of the Origin of the Dentition of the Rodentia," in 'American Naturalist,' vol. xxii. 1888, p. 9 *s.* and p. 12 (also his 'Primary Factors of Organic Evolution,' 1904, pp. 349-351 and p. 325).

*Fig. 3.* Upper surface of the three molar teeth. The oblique valleys between the cusps are shaded.

*Fig. 4.* The three transverse roots of the hindmost molar.

*Fig. 5.* The outer side of the middle tooth, with the front cusp (*a*) and hind cusp (*b*).

*Fig. 6.* The inner side of the middle tooth, with the front cusp (*a*) and hind cusp (*b*).

*Fig. 7.* The two middle cusps (*a* and *b*) of the middle tooth seen from inner side and partly from above.

X.—*Variation in the Prothoracic Spines of Dactylispa xanthopis, Gestro.* By S. MAULIK, B.A. (Cantab.), F.E.S.

IN the 'Természetráji Füzetek,' vol. xxi. 1898, p. 262, Dr. Gestro described this species from one example which now exists as the type in the National Museum at Budapest. This particular individual was taken at Darjeeling. In examining the collection of *Hispinæ* belonging to the Indian Museum, Calcutta, I have come across a group of seventeen examples collected by Atkinson at Jalapahar, Darjeeling. They were all mounted on one card. Among this lot I find one example that answers Dr. Gestro's description well—viz., the insect is black and shining, the abdominal segments and the legs are yellow, the colour of the basal five joints of the antennæ is different from that of the remaining apical joints, each side of the prothorax has a group of three spines which may be regarded as having a common base. The front margin has a pair of double spines. The other examples of the same lot before me agree with the description in the main—viz., the general form of the insect, the coloration (black, with the abdominal segments, antennæ, legs, and mouth-parts yellow), but differ in the following structures:—

- (1) On the front margin of the prothorax there are a pair of triple spines instead of double.
- (2) On each side of the prothorax there is a group of four spines instead of three. The latter are arranged in two ways—in some specimens the four spines have a common base, in others the fourth may be regarded as standing separate.

In a note published in the 'Annales Musci Nationales Hungarici,' 1907, p. 72, Dr. Gestro identifies the examples

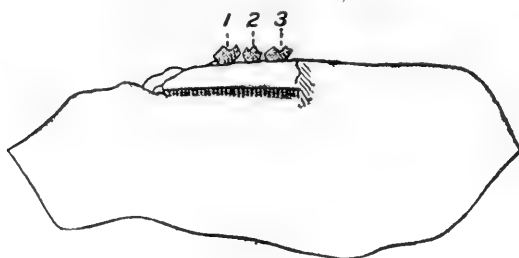


FIG. 1.

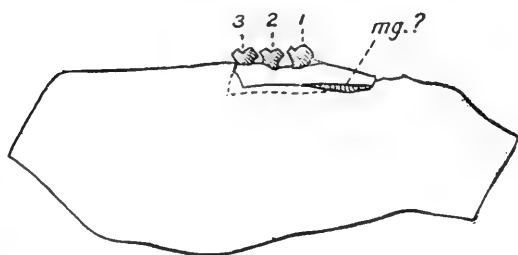


FIG. 2.



FIG. 3.

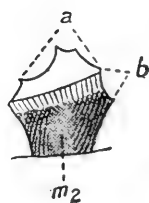


FIG. 5.



FIG. 6.



FIG. 4.



FIG. 7.

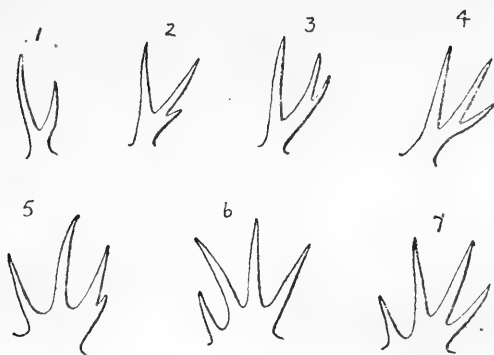


collected by Fruhstorfer from Sikkim as *D. xanthopus*, but points out that each side of the prothorax has got two spines, but he considers this circumstance an anomaly. He is quite right in thinking so. The object of this note is to show the variation in the number and formation of the prothoracic spines of *D. xanthopus*.

From the numerous examples before me it can be safely concluded that the normal number of the prothoracic spines is four on each side, and a pair of triple spines on the front margin—i. e., three spines standing on a common stock.

*Variation in the Spines on the Front Margin.*

Normally there is a pair of triple spines. The horizontal distance between them is as usual in most species of the genus. The spines stand erect; the first is always an appendix to the second arising from its front side; it may arise either near the base (fig. 2) or a little above (fig. 3), its



*Dactylispa xanthopus.*

Figs. 1, 2, 3, 4 are marginal spines at the front; 5, 6, 7 are the lateral groups of spines. The spines on the right of the figures point towards the head.

length may be quite small or it may attain the length of a normally developed spine (fig. 4), but it is always smaller than the second spine. The latter, together with the first, is slightly inclined forward. The third stands almost vertical and is the longest. The first spine may be entirely absent in some cases (fig. 1). Occasionally in the same individual

I have observed that of the pair of frontal spines, one consists of two spines and the other three. This, of course, is abnormal. There is no correspondence between the number of the frontal spines and the lateral ones. Each of the frontal pair may consist of two (fig. 1) or three, while the lateral group may be composed of four, three, or even two.

#### *Variation of the Lateral Group of Spines.*

The usual number is four, as is seen in the majority of specimens before me. They may be three, or even two, as Dr. Gestro has already pointed out in a little note. In one individual before me the group on the left side of the prothorax consists of three spines, while on the right there are three, with the first one having a little appendix arising from its front margin (fig. 5). The spines are slightly inclined outwardly to the vertical line, the front *i. e.*, one nearest the head is smaller than the second which follows it. The latter is inclined to be the longest, sometimes it is a little curved. The third is slightly shorter than the second. The fourth is always shorter than others; it is sometimes quite close to the third, but occasionally it may be considered as standing apart (fig. 7). For purposes of classification I should consider this group as consisting of four spines having a common broad base. It may be observed here that the individual having a lateral group of three spines has the basal joints of the antennæ ferruginous and has a fine longitudinal impression along the middle line. The whitish hairs on the surface of the prothorax are also more prominent. These characters are not seen in the examples having a lateral group of four spines.

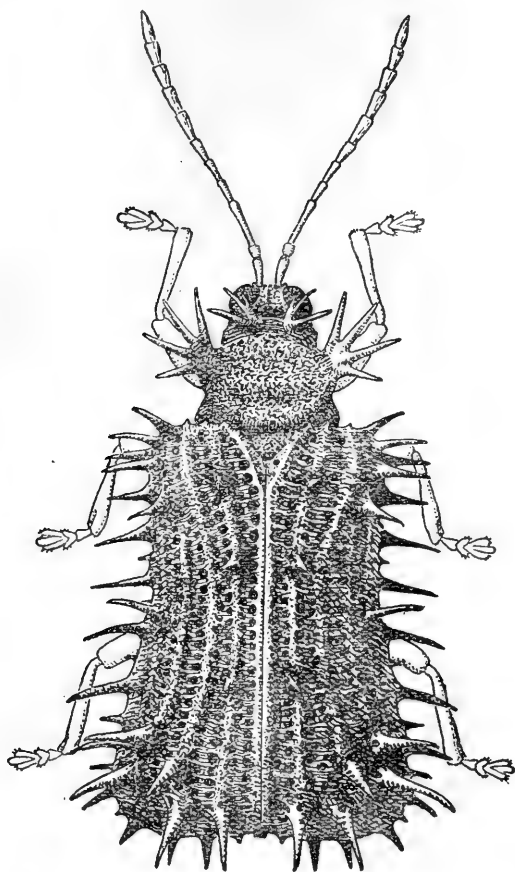
From the above considerations it will be seen that the type-specimen at Budapest Museum from which the first description was drawn up is not typical of the species; it is only an aberration. The normal form is one with a lateral group of four spines. There are specimens of the normal form in the British Museum, in the Genoa Museum, and in the Indian Museum, Calcutta.

#### *Description of the Insect.*

Body elongate, with a little constriction in the middle. The colour is shining black, specially on the elytra. The mouth-parts, the antennæ, the abdominal segments, and the legs are yellow. The antennæ are slender, with the apical

five joints more hairy, slightly thicker. The legs are also long and slender. The front margin of the prothorax has a pair of triple spines and each lateral margin a group of four spines. The number of the prothoracic spines varies. The elytra are punctate-striate and spiny.

Length  $3\frac{3}{4}$ – $4\frac{1}{2}$  mm.



*Dactylispa xanthopus*,  $\times 16$ .

*Head*: interocular space rugose, with a longitudinal cleft in the middle. The eyes are strongly convex. The antennæ are slender; their length is about two-thirds the total length

of the body ; the first joint is almost as long as the third, the second is much smaller ; fourth, fifth, and sixth are equal to each other in length ; seventh to eleventh are slightly thicker, more hairy, and darker. The mouth-parts are yellow. Viewed from underside there is a ridge along the middle of the interocular space.

*Prothorax* quadrate. The arrangement of the spines and their variation have been discussed above. In the accompanying figure (p. 73) the spines of the front margin are shown diagrammatically. It shows the number, but does not express the manner in which they stand. The upper surface has two transverse shallow depressions, it is coarsely and roughly punctate, it may have whitish hairs, and there may be a longitudinal impression along the middle. The last two characters may not be present in all examples. The surface is not so shiny as the elytra.

*Scutellum* triangular, with the apex rounded. The surface is subnitid and granulate.

*Elytra* constricted in the middle, punctate-striate ; the punctures are large, coarse, deep, and they touch one another. Owing to the spines on the elytra the number of rows of punctures cannot be accurately counted. On each side of the scutellum there is a short row of three or four minute spines. The humerus is raised, along the raised portion there are four long spines. Besides these spines on each elytron there are about nine or ten moderately long spines. The margin of each elytron, including the apical portion, has got about eleven long spines ; at the apex they have become very small. In between the long spines there occur very minute spines.

*Underside* smooth, shining, impunctate. The claw-joint projects beyond the third joint of the tarsus.

Eastern Himalayas : Darjeeling, Sikkim.

This species has not been reported from any other locality.

I thank Dr. C. J. Gahan for reading this note.

#### XI.—*Note on Epistictia reicheana*, Guérin.

By S. MAULIK, B.A. Cantab., F.E.S.

IN 1844 Guérin-Ménéville described a species, viz. *Calopepla reicheana*, in the 'Iconographie du Règne Animal de G. Cuvier,' texte ii. p. 286. He commences with the



following remark :—" Avec quelques *Imatidies* de l'Inde, M. Hope a établi et caractérisé les genres *Calopepla* et *Prioptera*, que M. Chevrolat avait distingués, sous les caractériser, sous les noms de *Craspedonta* et *Basiprionota* " \*. In the collection of the British Museum there exists a specimen which bears the following label in M. Guérin-Ménéville's handwriting: "*Craspedonta Reicheana* Guer. Ic. R. A. type Visapour." "Ic. R. A." means the reference given above. Visapour is a place in India. From the above remark it would seem that Chevrolat's name *Craspedonta* is the same as Hope's *Calopepla*. But having examined this specimen, I have come to the following conclusions :—

(1) *Reicheana* is not a *Calopepla* at all, but an *Epistictia*.

(2) It is identical with *Epistictia selecta* which Boheman described in 1850 (Mon. Cassid. i. p. 13). The differences between *Calopepla* and *Epistictia* are shown thus :—

#### *Calopepla*.

(1) In repose the head is inserted into the prothorax so that the mouth-parts are completely concealed from view.

(2) The apical five joints of the antennæ are dorso-ventrally flattened.

(3) The prothorax is narrower than the elytra at the base.

(4) The margins of the prothorax are strongly reflexed.

(5) The upper surface of the prothorax is smooth.

(6) The sculpturing of the elytra is more rugose in appearance.

(7) There are more than two strong costæ on each elytron.

#### *Epistictia*.

(1) In repose the head is not inserted into the prothorax, the mouth-parts are well exposed to view.

(2) The apical five joints of the antennæ are rounded.

(3) The prothorax is not narrower than the elytra at the base.

(4) The margins of the prothorax are not strongly reflexed.

(5) The upper surface of the prothorax is punctate.

(6) The sculpturing of the elytra is much less rugose in appearance.

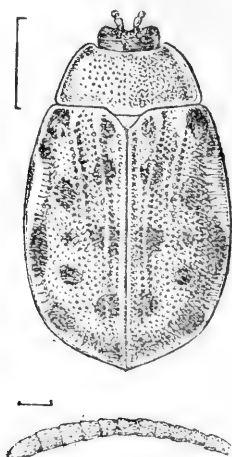
(7) There are only two weak costæ on each elytron, one nearer to the suture vanishing at the apical surface and the other at about the middle.

Guérin's species *reicheana* has all the characters mentioned above under *Epistictia*, and does not possess one single character named under *Calopepla*; it is, therefore, without doubt an *Epistictia*.

As to the identity of *reicheana* with *selecta*, it may be

\* In d'Orbigny's 'Dictionnaire d'Histoire Naturelle' a short characterization of both these names will be found, but it was later than Hope's. Chevrolat published them perhaps owing to their being adopted by Dejean in his Catalogue.

remarked that, after examining ten examples in the collection of the British Museum, I find that (1) the colour of the insect varies from dark red to light brown, (2) twelve green spots or patches are always present on each elytron. *Reicheana* is very dark red and has twelve green spots on each elytron at identical positions; the dark background almost obscures the green spots. As there is no structural difference, one cannot help the conclusion that they are the same species. Boheman's species *selecta* must therefore be a synonym of Guérin's *reicheana*, the latter having the priority.



*Epistictia reicheana*, from a co-type in the British Museum.  
Antenna—*E. selecta*.

There are four examples in the British Museum from Ceylon which Boheman has called *matronula*. They are exactly the same as *selecta*, but only lighter in colour; the number and position of the green spots on the elytra are the same, but they stand out in bold outlines because of the lighter background. This circumstance may lead one to think, at first sight, that it is a different species. I am inclined to the view that it is only a Ceylonese variety, the dark variety generally occurring in Northern India. I therefore regard *matronula* as a lighter variety of *reicheana*. An illustration of *reicheana* is added.

I thank Dr. Gahan for reading this note.

XII.—*New Species and Races of Ithomiinæ in the Joicey Collection.* By W. J. KAYE, F.E.S.

SOME striking new species and forms are here described. The race *joiceyi* of *Tithoria bonplandii* is quite stable, as no typical *bonplandii* came with them, and the series of twelve ♂♂ are quite uniform. Haensch, in Seitz, vol. v. p. 119, separates *tamasea*, Hew., with *lugubris*, Hsch., as a distinct species, and *regalis*, Stich., as another species distinct from *bonplandii*; but these are all forms of the same—*bonplandii*.

The three new species of *Pteronymia* are in each case female specimens and only single individuals. They are all remarkably large species, and in the case of *catenata* of curious pattern, the very large marginal spots giving the insect a distinct appearance. Five new species of *Napeogenes* are described and one new subspecies of *Napeogenes*. There are two new species of *Hymenitis*, one *Scada*, one *Callithomia*, two *Epithomia*, one *Hyposcada*, and two *Athesis*. One of the last at first glance looks like a large dark *A. clearista*, but it is a distinct species from N. Peru. The other, a dark subspecies of *Clearista* from Colombia, must be well known, and it seems strange that Haensch did not make for it subspecific rank. The series at Witley shows it to be quite a well-marked race. Typical *Clearista* occurs in Venezuela and also in Colombia, but probably only as an aberration in the latter country.

All these forms and species will be figured after the War.

*Athesis clearista colombiensis*, subsp. n.

Fore wing darker than in the type-form. The discoidal blotch heavier black, without any ochre colour at lower angle of cell, and the black extending down towards vein 2. In the type-form this is always ochreous. The veins blacker, especially vein 3, which has stripe along it. Hind wing with the veins 3, 4, 5 blacker and the outer margin broader black. Ochre colour at discocellulars and along veins 1 and 2 more reddish than in *Clearista clearista*.

5 ♂♂, 8 ♀♀.

*Hab.* Colombia, "Interior," Cauca Valley, S. Martin, Llanos of Rio Meta (*G. D. Child*).

*Athesis vitrala*, sp. n.

Larger than *A. clearista*, darker and more transparent.

Fore wing with costa dark brownish, becoming more ochreous beyond the cell, then again dark blackish brown. Inner margin broadly black. A black band across middle of cell and black discoidal mark. Veins dark. Outer margin very narrowly black, and where it meets costa narrowest. A transparent area between veins 7, 8. Hind wing transparent, the veins very dark brown. Marginal bands narrow. Fore wing below with light brown costa and triangular terminal areas to the veins. Tornus light brown. Just before apex on inner side of narrow marginal band two or three whitish spots. Underside of hind wing with the costa broadly whitish, followed by a broad black band shading off into light brown. A row of white submarginal spots alternately with light brown patches, which run into the dark narrow marginal band.

Expanse 84 mm.

1 ♀.

*Hab.* N. Peru, River Tabaconas, 6000 feet.

*Tithorea bonplandii joiceyi*, subsp. n.

Above: Fore and hind wing black with white markings. A trace of yellow scaling along the basal and median veins where the white band crosses. Beneath with a great extension of red marking. Fore wing with a red streak below costa, a broad red band on either side of the subapical line of white dots uniting into a submarginal band. Hind wing with a short red costal streak, a red band on either side of the postdiscal white dotted line, merging into a broad red subcostal band.

Expanse 90 mm.

*Hab.* Cauca Valley, Colombia; Corinto, May-July.

10 ♂♂, 1 ♂ without locality, 1 ♂ Brit. Guiana (err. loc.!).

This remarkable race of *bonplandii* is so distinct-looking as to at first glance appear as a good species, but in the Joicey Collection is a specimen of *bonplandii latreillei* showing incipient extension of the red markings beneath as to at once suggest racial and not specific rank. The change of colour from yellow to white, although frequently observable in the *Heliconidæ*, is a rare phenomenon in the *Ithomiinæ*.

*Napeogenes curvilutea*, sp. n.

Fore wing orange-brown, with a black streak along the median vein to just beyond origin of vein 2, and another

black streak just below along inner margin. Apical half black, containing a broad curved yellow mark from costa to vein 3. A very indistinct row of greyish marginal spots. Hind wing orange-brown, with a large oblong black patch from base to vein 4 on its anterior side, but only to vein 2 on its posterior or inner marginal side, leaving a curved, gradually tapering bit of the orange-brown ground-colour. Fore wing below similar to above, but marginal white spots very distinct. Hind wing below also with white marginal spots, but smaller and elongated. A black mark within the cell and a black streak along costal vein.

Expanse 57 mm.

3 ♂♂, 1 ♀.

*Hab.* N. Peru, Pebas, Loreto, 1913.

*Napeogenes diaphanosa*, sp. n.

Fore wing brownish transparent and black. Costa, inner and outer margins black. Basal half of wing brownish transparent. Apical half black, with a large squarish transparent patch between veins 5 and 7, with a small transparent spot immediately above. A series of three transparent spots, the centre one more elongated, situated near the margin between veins 2, 3; 3, 4; and 4, 5. A series of very distinct white marginal spots. Hind wing brownish transparent, with a broad black marginal band containing a series of white spots. Antennæ black.

Expanse 52 mm.

1 ♂, 3 ♀♀.

*Hab.* Colombia, Valdivia (*Pratt*, 1897).

Comes nearest in shape and pattern to *Napeogenes amara*.

*Napeogenes opacella*, sp. n.

Fore wing with the base reddish orange, the costa black; a large black roundish blotch within the cell, followed by an irregularly shaped yellow blotch. Outer two-thirds of wing with the ground-colour black. A large subapical yellow patch with its distal margin curved. Between veins 2, 3 and 3, 4 are irregular yellow blotches. A row of large yellow marginal spots. Hind wing with the base reddish orange, the remainder black, with a marginal row of yellow spots, preceded by a row of three larger irregular yellow spots in the upper half of the wing. At vein 3 the black ground-colour is set back greatly, from thence tapering to a point at

anal angle. Sometimes a black spot between veins 2, 3 close to cell.

Expanse 50 mm.

3 ♀ ♀.

*Hab.* Colombia, Quebrada de la Sarga, Rio Tomana.

This species figures in some collections as *N. aster*, but it is quite distinct. *N. aster*, Godm., is the Ecuador dark race of *stella*. *N. glabra*, Godm., is exceedingly close to *stella* and is doubtfully of subspecific rank. *N. decora*, Godm., is quite a distinct species with much narrower wings. Haensch, in Seitz, makes these all forms of *stella*, but was evidently unacquainted with the types.

*Napeogenes mesosticta*, sp. n.

♀. Antennæ yellow-tipped. Fore wing dusky transparent, with black margins tinged with reddish interiorly. No discoidal spot. A very distinct row of submarginal white spots. Inner margin very broadly black from base for one-third, thence tapering to tornus. Costa blackish and a half black spot across centre of cell merged partly in the black costal stripe. Hind wing dusky transparent, with very broad black outer margin tinged internally with reddish. A distinct series of white submarginal spots. Yellowish along inner margin and with a broad black costa widened considerably at base. Fore wing below with the costa, cell-mark, and inner crenulated edging of marginal band broadly brownish red. Hind wing below with the costa broadly brownish red, succeeded by a horizontal black streak, followed by reddish again in outer half of cell. Inner edging of submarginal band broadly brownish red.

Expanse 68 mm.

*Hab.* Peru, Pozuzo, 5000-6000 feet.

Related to *N. glycera*, but a distinct species.

*Napeogenes polymela*, sp. n.

Very close to *N. harbora*.

♂. Fore wing black and transparent. The costa black. Discoidal spot black. Outer margin broadly black, with very distinct white submarginal spots. A triangular black patch between median and vein 2. Inner margin broadly black. Hind wing transparent, the outer margin very broadly black, containing a row of very distinct submarginal white spots.

Inner margin yellowish, edged slightly with reddish. Antennæ black.

♀. Similar to male, but no yellow at inner margin.

Expanse 56 mm.

*Hab.* Peru, Pozuzo, 5000–6000 feet.

This may be only a race of *N. harbora*, the type-form coming from Ecuador. *N. harbora* varies in the hind wing from colourless to yellow-tinged, when it is known as *eunomia*; and it is possible that *polymela* varies in the same way. The apparent difference in the undersides between *harbora* and *eunomia*, the former having a considerable red edging along the margins, is bridged with intermediate forms. *Eunomia* occasionally has strong red markings, although remaining yellow-tinged in the hind wing.

*Napeogenes zurippa apobsoleta*, subsp. n.

Fore wing with the basal half orange. A narrow black inner marginal line and a somewhat rectangular-shaped black spot within the cell and just touching the outer edge of the orange ground-colour. An oblique yellow median band enclosing a small black discoidal spot from which runs a short black line to origin of vein 10. Apical half wholly black, without any trace of yellow marks. Hind wing brownish orange, with four elongated black patches; the two innermost are nearly completely fused, the third is joined posteriorly, while the smaller fourth is entirely separate.

Expanse 58 mm.

1 ♂.

*Hab.* Ecuador, without precise locality.

*Callithomia alexirrhoe concolor*, subsp. n.

Fore wing wholly reddish brown and black. Cell with large black central blotch and smaller spot in the upper corner of the cell. In the large black apical area beyond the cell are placed four large elongate patches of the reddish-brown ground-colour. Inner margin black and a short black costal streak from base. Hind wing reddish brown, with a double row of black spots, those immediately below the cell much the largest.

Expanse 68 mm.

1 ♀.

*Hab.* Peru, without precise locality.

This subspecies comes nearest *C. infuscata*, Hsch. *C. thorax* is a self-coloured race, but has a black apex and only a single row of black spots to the hind wing.

*Callithomia viridipuncta*, sp. n.

Fore wing with the base black and a black, suffused, transparent patch at the end of the cell. Inner margin black except for a short brownish streak in the middle area. Between veins 2, 3; 3, 4; and 4, 5 are greenish, transparent, elongated patches, the lower one the largest, while the upper two are edged with whitish exteriorly. Beyond vein 5 is a compound greenish transparent area composed of two long patches and two small costal spots. Hind wing unicolorous orange-brown, a small black spot in the middle discocellular, marginal black band just traceable. Fore wing beneath as above, except for four white marginal dots at margin of apex. Hind wing below with a broad black subcostal streak, widest at base and at end of cell. A festooned greyish-black marginal band containing a series of white spots. Antennæ black, with the club-yellow-brown.

Expanse 66 mm.

1 ♀.

*Hab.* Ecuador, without precise locality.

*Callithomia viridipuncta*, ab. *confluens*, ab. nov.

Fore wing with the transparent patch within the cell without black dusting. The greenish transparent marks between the veins all united, leaving only a large, black, squarish discoidal patch. Hind wing with the central area semitransparent and reaching down to close to margin before vein 4. Black marginal band distinct and very irregular on its inner edge. Fore wing below with traces of a reddish submarginal band. Hind wing below with a very distinct row of white marginal spots within the crenulated black marginal band.

1 ♀ without locality.

*Hyposcada attilodes*, sp. n.

♂. Fore wing like ♀ of *Leucothyris attalia*, but may be recognized by the pear-shaped translucent spot at tornus and the absence of a transparent spot between veins 3, 4 close to cell. An outer transparent spot is present between veins 3, 4,



but close to margin corresponding with a similar spot in the *Leucothyris*. Costa black. Inner margin broadly black. A wedge-shaped black mark across the cell; a heavy black discoidal blotch extended greatly towards the margin. Three transparent spots close together just beyond cell and lying near costa. Three subapical spots and three marginal dots. Hind wing with a very broad black transverse band extending beyond cell. A row of transparent spots from inner to outer margin smaller than in *L. attalia*, the two at the apex especially so. Two or three small white marginal dots. Underside of fore wing with more black than in the *Leucothyris* species. The band across the cell black, not red-brown, and the white marginal spots small.

Expanse 64 mm.

*Hab.* Bolivia, no precise locality.

1 ♂.

This remarkable species, so extremely like ♀ *Leucothyris attalia* except for the slender long antennæ, appears to have been undetected till now amongst the series of *L. attalia*. There are, besides the type ♂ in Coll. Joicey, 2 ♂ ♂ and 2 ♀ ♀ in the British Museum, and doubtless many others remain to be discovered in various collections. The ♂ of *L. attalia* is very much larger than the ♀, but ♂ and ♀ of *H. attilodes* are about the same size. From the very brief description of *attalita*, Hnsch., it is impossible to say if this is the same species. But no mention is made of the different shape or the long slender antennæ, characters which could scarcely have escaped observation.

*Scada perpuncta*, sp. n.

Fore wing pale transparent yellowish. Costa narrowly grey-black except immediately above cell, where it is yellowish. A large, solid, square, black discoidal blotch. Inner margin black except at base. Broad outer margin black, containing a very distinct row of white spots. Hind wing pale transparent yellowish, with a large solid roundish discoidal blotch. A black marginal band (much narrower than fore wing band) containing series of white spots.

Expanse 42 mm.

4 ♂ ♂.

*Hab.* S.E. Colombia, Rio Caqueta (*D. M. Eder & T. Alexander*).

*Pteronymia catenata*, sp. n.

Fore wing smoky at apex. Cell completely margined with blackish; a broad wedge-shaped mark in the cell and heavy discoidal blotch extending greatly outwards between veins 4, 5. A subapical vitreous spot and a row along outer margin. A small whitish mark beyond cell on costa. Below as above, with all the dark markings dull brownish edged with blackish. Hind wing with some dark scaling along lower discocellular and along median. A very broad dark marginal band containing three very large vitreous spots and one small spot situated above vein 5. Below as above, with all the dark markings dull brownish.

Expanse 70 mm.

1 ♀.

*Hab.* Peru, Pozuzo, 5000–6000 feet (native collector).

A striking species and quite unlike any other, the very large marginal transparent spots in the hind wing giving the insect a very distinct appearance.

*Pteronymia amplificata*.

Fore wing transparent, with the costa orange-brown interrupted by a yellow spot just above discocellulars. Discoidal spot large, dark brown, median and veins 2 and 3 orange-brown. Inner margin broadly dark brown. Apex dark brown and a narrow lunular marginal dark band. Against a dark background there are to be seen same yellowish scaling beyond discoidal spot and a series of faint yellow submarginal spots. Hind wing transparent, with a rather broad dark lunular marginal band. Against a dark background a series of large yellowish submarginal spots. Hind wing beneath with large cruciform orange marks at vein-tips and between veins 2, 3; 3, 4; 4, 5 are paired white spots. Between veins 5, 6 and 6, 7 single spots of a different shape.

Expanse 68 mm.

*Hab.* Ecuador.

1 ♀.

*Pteronymia grandipennis*, sp. n.

Fore wing smoky transparent. Costa above cell reddish. Discoidal spot narrow and continued down the median to dark inner margin. A small whitish spot on costa beyond end of cell. A row of faint whitish submarginal spots and

some whitish marks beyond the cell, forming a very indistinct sort of band to inner margin. Hind wing above transparent, with a yellowish tinge at anal angle. Some indistinct whitish submarginal spots in apical area, becoming less and less defined towards anal angle.

Expanse 68 mm.

1 ♀.

*Hab.* ? Peru, Pozuzo.

There is no locality-label on the specimen, but it is in good condition and well set, and as it was amongst some *Velamysta torquatilla* from Pozuzo, Peru, it seems probable that the locality hazarded is correct. The fairly strong mimetic resemblance to the *Velamysta* also lends support to the place of origin.

*Hypoleria ina negrina*, subsp. n.

Differs from the type-form in the absence of red at anal angle of hind wing.

Expanse 56 mm.

*Hab.* Ecuador.

Hewitson gave no locality for his *Ithomia ina*, but it probably occurs with other similarly coloured Ithomiine species such as *Ceratinia praxilla* in Ecuador. The two forms may occur together or be racial. The very similarly coloured *Ceratinia ocna* and *Napeogenes apulia* have, in addition, yellow tinting on the hind wing, and this is a characteristic of Central-Colombian Ithomiines.

*Hymenitis joiceyi*, sp. n.

Closely resembles *Dismenitis pardalis*, but easily separable by the neurulation.

Fore wing brownish transparent, with the veins prominently orange when held in certain lights. Costa brownish orange edged narrowly with dark brown. A large, somewhat cruciform, blackish discoidal mark. Inner margin black. Outer margin with blackish triangular patches at the vein-tips of veins 2, 3, 4, 5. Apex with a blackish margin. Paired white dots between the veins, to be seen clearly only when held against a dark background. Hind wing brownish transparent, with a very heavy blackish discoidal patch. A broad black marginal band, deeply sinuous internally, and on the margin between the veins are heavy white spots, becoming smaller towards costa.

Expanse 74 mm.

2 ♀ ♀.

*Hab.* Ecuador, without precise locality.

*Hymenitis oneidodes*, sp. n.

Fore wing above yellowish brown, with the veins orange. Costa orange to end of cell, inner margin blackish, tip with blackish border. Veins 2, 3, 4, and 5 with triangular blackish marks at tips, that at vein 3 the largest. An irregular discoidal black blotch spreading over lower discocellular. Hind wing above yellowish brown, with a very broad blackish marginal band, heavily dentated on inner margin, especially between veins 3 and 4. A faint indication in some lights of a yellow macular band from upper discocellular to outer margin. Two yellowish subapical spots and two further yellow spots on outer margin. Fore wing beneath as above. Hind wing beneath with large white wedge-shaped marks in the apical portion of marginal dark band and paired white spots between the veins thence to inner margin.

Expanse 67 mm.

1 ♀.

*Hab.* Ecuador.

XIII.—*Notes on Fossorial Hymenoptera*.—XXXII. *On new Species in the British Museum.* By ROWLAND E. TURNER, F.Z.S., F.E.S.

Family *Scoliidæ*.

Subfamily *ELIDINÆ*.

*Elis (Mesa) ugandensis*; sp. n.

♀. Nigra; capite, femoribus anticis apice, tibiis anticis, tarsisque anticis rufis; flagello articulis quatuor apicalibus nigris; alis nigro-violaceis.

Long. 15 mm.

♀. Mandibles bluntly bidentate at the apex; clypeus with a strong carina from the base nearly reaching the apex, the apical margin with two minute teeth in the middle. Antennal tubercles large and rounded; head rectangular, much broader than long, eyes separated from the hind margin of the head by a distance equal to their greatest breadth; posterior ocelli twice as far from the eyes as from each other, and about three times as far from

the hind margin of the head as from each other; front closely and deeply punctured; vertex smooth and shining, with a few small scattered punctures. Thorax rather sparsely punctured, shining; the pronotum longer than the mesonotum; scutellum as long as the pronotum. Median segment broader than long, sparsely punctured, more closely at the base than at the apex, with two carinæ very near together converging from the base and almost touching at the apex; the apical slope rugosely punctured, the sides of the segment rather indistinctly obliquely striated. Abdomen shining, with large scattered punctures; sixth tergite rather more closely punctured, but without striæ. Hind femora produced into a strong spine near the apex beneath; hind tibiæ serrate; basal joint of the hind tarsi with a row of fine hairs beneath. Second abscissa of the radius very long, much longer than the third.

*Hab.* Tero Forest, Uganda (*C. G. Gowdey*), July 1912.

Nearly allied to the Oriental *E. tricolor*, Sm., both in the puncturation and the long second abscissa of the radius; but differing in the absence of the steel-blue colour on the abdomen, in the somewhat more slender build, in the different form of the clypeus, and in the narrower hind femora with a much more strongly developed spine. Not nearly allied to any other Ethiopian species.

*Elis (Mesa) tricolor*, Sm.

*Myzine tricolor*, Sm. Journ. Proc. Linn. Soc., Zool. ii, p. 91 (1858).

There are three closely allied forms in the British Museum, probably representing local races of one species. These may be separated by the following key:—

1. Anterior ocellus very distinctly further from the posterior margin of the head than from the antennal tubercles; scape and three basal joints of flagellum red; clypeus with a low median carina not reaching the apex; posterior slope of the median segment not concave in the middle ..... *E. tricolor longiceps*,  
[subsp. n.]
- Anterior ocellus as near to the posterior margin as to the antennal tubercles or nearer; antennæ wholly black; carina of clypeus very prominent or wholly absent; posterior slope of the median segment slightly concave ..... 2.
2. Clypeus with a very prominent carina ending in a raised tubercle ..... *E. tricolor tricolor*, Sm.
- Clypeus depressed in the middle, without a median carina ..... *E. tricolor shuckardi*,  
[subsp. n.]

*Hab. E. tricolor tricolor*, Sm., Borneo.

*E. tricolor longiceps*, subsp. n., Dibrughur, Assam.

*E. tricolor shuckardi*, subsp. n., India (probably the South or West), ex coll. Shuckard.

*E. dimidiaticornis*, Bingham, and *E. crassepunctata*, Turner, will probably prove to be the males of the two Indian sub-species.

## Superfamily SPHECOIDEA.

### Subfamily SPHECINÆ.

*Sphex (Psammophila) lutaria*, Fabr.

*Sphex lutaria*, Fabr. Mant. Insect. i. p. 273 (1787).

*Ammophila affinis*, Kirby, Trans. Linn. Soc. iv. p. 195 (1798).

Specimens from Gyangtse, Tibet, have the first tergite almost entirely black.

*S. hirsuta*, Scop., occurs in the same locality.

*Sphex (Psammophila) mahatma*, sp. n.

♀. Nigra; abdomine segmentis primo, secundo, tertio quartoque dimidio basali rufis; femoribus anticis apice extremo subtus, tibiis anticis subtus, tarsis anticis, articulo primo basi nigro, tarsisque intermediis et posticis articulis tribus apicalibus ferrugineis; alis subhyalinis, venis nigris.

Long. 12–19 mm.

♀. Hairs of the head and thorax black, sparse; inner orbits parallel; posterior ocelli separated from the eyes by a distance about equal to the length of the third joint of the flagellum. Front densely, clypeus and vertex much more sparsely punctured; pronotum, mesonotum, and scutellum shining, very sparsely punctured; the mesopleuræ closely and rather indistinctly striated with large punctures between the striæ. Median segment opaque, transversely striated; the striæ very fine and close, only visible with a lens; the sides and apical slope of the segment more coarsely striated. Anterior coxæ not tuberculate at the apex; joints of the fore tarsi strongly asymmetrical; pulvilli distinct, not very small; tarsal unguis with a very minute tooth at the base. Petiole as

long as the second joint of the hind tarsus. Radial cell rounded at the apex.

*Hab.* Gyangtse, Tibet, 13,000 ft. (*H. J. Walton*), June 30, 1904. Khamba Jong, Sikkim, 15,000–16,000 ft.

The striation of the dorsal surface of the median segment is much finer than in *S. lutaria*, from which it also differs in the colour of the nervures, tarsi, and first abdominal segment and in the sparser punctures of the mesonotum.

The male has the petiole longer than the second joint of the hind tarsus, but distinctly shorter than the basal joint and the colour of the tarsi is fuscous.

*Sphex (Psammophila) sheffieldi*, sp. n.

♀. Nigra, nigro-pilosa; mandibulis basi, segmentis abdominalibus primo, secundo tertioque basi rufis; clypeo argenteo-pubescente; alis flavidulis, margine apicali pallide infuscatiss, venis fusco-ferrugineis.

Long. 22–27 mm.

♀. Head large and massive, broader than the thorax, densely punctured, clothed with black hairs, the clypeus with a delicate silver pubescence beneath the black hairs. Clypeus broadly truncate at the apex, the apical margin deflexed, the angles of the truncated margin well marked. Inner orbits parallel, the posterior ocelli separated from the eyes by a distance distinctly exceeding the length of the third joint of the flagellum. Thorax and median segment coarsely rugosely punctured, mesonotum with a distinct carina from the base to the middle; mesopleuræ rugose. Anterior coxæ not tuberculate at the apex; joints of the anterior tarsi asymmetrical, but not strongly so; tarsal unguis without a tooth. Petiole as long as the basal joint of the hind tarsi, the basal third strongly punctured and clothed with black hairs. Radial cell rather long, narrowly rounded at the apex; third cubital cell small, the second transverse cubital nervure nearly twice as long as the cubital margin of the cell and about three times as long as the radial margin.

*Hab.* Mlanje, Nyasaland (*S. A. Neave*), March 12–May 5, 2400–7000 ft.

*Sphex (Parapsammophila) testaceipes*, sp. n.

♂. Niger, albo-pilosus; mandibulis, apice excepto, clypeo in medio nigro-lineato, tegulis, pedibusque rufo-testaceis; coxis posticis, trochanteribus femoribusque posticis supra, tarsis intermediis posticisque articulo apicali, unguiculisque nigris; alis hyalinis, venis fusco-ferrugineis.

Long. 25 mm.

♂. Clypeus broadly rounded at the apex, subdenticulate in the middle of the apical margin, clothed with delicate silver pubescence, which extends on to the front. Head and sides of the thorax rather densely clothed with long white hairs, the hairs on the mesonotum and dorsal surface of the median segment cinereous. Eyes convergent towards the clypeus, where they are separated by a distance slightly exceeding twice the length of the scape and first joint of the flagellum combined. Posterior ocelli separated from the eyes by a distance scarcely equal to the length of the third joint of the flagellum. Head and pronotum punctured-rugulose, the clypeus shining and almost smooth; mesonotum rugulose; dorsal surface of median segment closely transversely striate, the striæ slightly curved in the middle. First joint of the petiole a little longer than the hind femur; second tergite longer than the apical breadth; seventh tergite broadly truncate at the apex; eighth sternite long, the sides almost parallel, the apex rather broadly truncate. Mesosternum not produced anteriorly. Tarsal ungues with two teeth close to the base; pulvilli large. Second recurrent nervure almost interstitial with the second transverse cubital nervure; second abscissa of the radius much longer than the third, third transverse cubital nervure rather strongly curved outwardly in the middle.

*Hab.* Valley of the Ruaha River, German East Africa (*S. A. Neave*), December 1910.

This has somewhat the build of *S. dives*, Brullé, but may easily be distinguished by the colour of the legs, the form of the apical segments, the broader head and clypeus, and the sculpture of the median segment, also by the presence of two teeth on the tarsal ungues.

*Sphex (Parapsammophila) erythrocephala*, Fabr.

*Sphex erythrocephala*, Fabr. Spec. Insect. i. p. 445 (1781). ♀.

*Ammophila fuscipennis*, Sm. Trans. Zool. Soc. London, vii. p. 187 (1870). ♂.



The tarsal ungues of the male have two teeth—not one only, as stated by Bingham.

*Sphex haimatosoma*, Kohl.

*Ammophila haimatosoma*, Kohl, Verh. zool.-bot. Ges. Wien, xxxiii. p. 383 (1883). ♀.

Specimens of this species were taken at Karachi by Mr. Comber. They are very highly coloured, being without black on the head and thorax, and with the blue colour of the apical abdominal segments more strongly developed; the wings are of a deep yellow. *S. basalis*, Sm., which also occurs at Karachi is very near this species, but has the mesonotum much more strongly striated and is very different in colour.

*Sphex punctata*, Sm.

*Ammophila punctata*, Sm. Cat. Hym. B.M. iv. p. 218 (1856). ♀.

I cannot see that this differs specifically from *S. sabulosa*, Linn., though the red on the abdomen is more extensive. This form occurs at Gyantse in Tibet in June.

Subfamily *PHILANTHINÆ*.

*Cerceris spinipleuris*, nom. n.

*Cerceris varipes*, Sm. Ann. & Mag. Nat. Hist. (4) xii. p. 413 (1873). ♀.  
(Nec Smith, 1858).

This Australian species is quite distinct from the species described by Smith from Celebes in 1858 as *C. varipes*, so a new name is necessary.

*Cerceris yalensis*, Turn.

*Cerceris yalensis*, Turn. Trans. Ent. Soc. London, p. 745, 1912 (1913).  
♀ (nec ♂).

The female is the type of the species. The male described with it does not belong to it, but to *C. cratocephala*, Cam.

Subfamily *STIZINÆ*.

*Stizus persimilis*, sp. n.

♀. Nigra; clypeo, labre, mandibulis, palpis, antennis, pronoto

margine postico, in medio angustissime, lateribus late, callis humeralibus, mesonoto fascia laterali utrinque ante tegulas, femoribus anticis, femoribus intermediis posticisque apice, tibiis tarsisque flavo-aurantiacis; segmentis dorsalibus secundo macula parva utrinque angulis apicalibus, tertio quartoque fascia lata longitudinali laterali, quinto fere omnino, sextoque omnino flavis; alis nigro-cæruleis.

Long. 16 mm.

♀. Extremely near to *S. klugii*, Sm. (*S. apicalis*, Klug), of which I formerly considered it a variety (see Ann. & Mag. Nat. Hist. (8) xvii. p. 444, 1916). But I have since had the opportunity of comparing it with a female of *klugii* in the collection of the Rev. F. D. Morice, and find the following distinctions in addition to colour:—

<i>S. klugii</i> .	<i>S. persimilis</i> .
First tergite sparsely punctured.	First tergite closely punctured.
Sixth tergite closely rugosely punctured.	Sixth tergite sparsely and more finely punctured.

*Hab.* 30 miles from Magadi Junction, British East Africa (*F. G. Hamilton*), April 1912.

### Subfamily CRABRONINÆ.

#### *Rhopalum ornatipes*, sp. n.

♀. Nigra; mandibulis, apice excepto, clypeo, scapo, flagello dimidio basali subtus, pronoto, scutello, tegulis, pedibus anticis intermediisque, trochanteribus posticis, tibiis posticis dimidio basali, metatarsisque posticis flavis; alis hyalinis, iridescentibus, venis fuscis.

Long. 4 mm.

♀. Eyes separated at the base of the clypeus by a distance equal to about one-quarter of the length of the scape, the facets much larger in front than on the side; clypeus short and broad, clothed with delicate white pubescence. Head smooth and shining, an indistinct groove from the posterior ocelli not quite reaching the eyes; temples about half as broad as the eyes. Thorax smooth and shining; pronotum transverse; median segment almost smooth, with a well-marked median sulcus. First tergite very slightly longer than the second, not much swollen at the apex; second tergite broadened from the base, nearly half as long again

as the third. Serration of the hind tibiæ almost obsolete. Radial cell broadly truncate at the apex; recurrent nervure received close to two-thirds from the base of the cubital cell.

*Hab.* Zungeru, N. Nigeria (*J. W. Scott-Macfie*), January-February 1911.

*Rhopalum spinulifer*, sp. n.

♂. Niger; scapo, pronoto, postscutello, callis humeralibus, pedibus anticis intermediisque, trochanteribus coxisque exceptis, flavis; segmentis abdominalibus duobus basalibus subtus lateribusque, segmentis sexto apice, septimoque, femoribus posticis apice, tibiis posticis supra nigro-maculatis, metatarsisque posticis basi ferrugineis; tegulis brunneis; alis hyalinis, iridescentibus, venis nigris; petiolo apice spina minuta armato.

Long. 4 mm.

♂. Eyes separated at the base of the clypeus by a distance about equal to the length of the scape; antennæ short, the basal joints of the flagellum normal, not tuberculate or emarginate. Head subopaque, very minutely punctured; posterior ocelli as far from each other as from the eyes. Pronotum transverse, not rounded at the angles; thorax subopaque, minutely and closely punctured. Petiole rather stout, distinctly swollen at the apex, with a small spine at the apex on the dorsal surface; the second tergite half as long again as the first, broadened from the base, no longer than the third. Hind tibiæ stout, distinctly but not strongly serrate. Radial cell very broadly truncate at the apex; recurrent nervure received just beyond the middle of the cubital cell.

*Hab.* Kuranda, N. Queensland (*F. P. Dodd*).

In the form of the petiole and following segments this resembles *R. frenchii*, Turn., but differs much in colour and in the remarkable spine on the petiole.

*Rhopalum imbelle*, Turn.

*Rhopalum tricolor*, Sm., subsp. *imbelle*, Turn. Ann. & Mag. Nat. Hist. (8) xv. p. 92 (1915).

In addition to the distinctions given in the description, the male antennæ are much shorter in *imbelle* than in *tricolor*; the third joint of the flagellum, which is emarginate beneath, being more than twice as long as the apical breadth in *tricolor*, and scarcely half as long again in *imbelle*. On

the whole, I am inclined to think that the two forms should stand as distinct species.

Subfamily *LARRINÆ*.

*Tachytes diversicornis*, sp. n.

♂. Niger, albo-pubescent; flagello articulis 5-9, articuloque quarto subtus fulvis; tarsis brunneo-rufescentibus; segmentis dorsalibus 4 basalibus fascia apicali argenteo-pubescente; segmento septimo dense argenteo-pubescente; alis hyalinis, venis tegulisque testaceis.

♀. Mari simillima; antennis nigris; segmento dorsali sexto aureo-pubescente.

Long., ♂ 9 mm., ♀ 10 mm.

♂. Clypeus very broadly rounded at the apex, clothed with silver pubescence, which extends on to the face; joints of the flagellum not arcuate. Eyes separated on the vertex by a distance fully equal to the combined length of the two basal joints of the flagellum. Thorax and median segment clothed with short whitish hairs; the median segment scarcely as long as the scutellum and postscutellum combined. Seventh dorsal segment broadly rounded or subtruncate at the apex; eighth ventral segment strongly emarginate, the apical angles of the emargination produced into acute spines. Radial cell narrowly rounded at the apex, third abscissa of the radius longer than the second, the third cubital cell extending on the cubitus beyond the apex of the radial cell. Basal joint of the fore tarsi with three small white spines.

♀. Basal joint of the fore tarsus with five spines. Second ventral segment subopaque, microscopically punctured, the apical margin broadly smooth in the middle; pygidial area subtriangular, narrowly rounded at the apex.

*Hab.* Karachi (*E. Comber*), September and October.

This approaches the Algerian *T. maculicornis*, Saund., but in that species the male has the joints of the flagellum thickened and arcuate beneath. In both species the intermediate metatarsus of the male is curved and somewhat strongly asymmetrical at the apex. The female of *maculicornis* has the pygidial area clothed with silver pubescence.

*Tachytes nilotica*, sp. n.

♀. Nigra, albo-pubescent; mandibulis, palpis, femoribus, tibiis tarsisque ferrugineis; femoribus anticis basi nigro suffusis;

tegulis testaceis; segmentis abdominalibus 1-5 apice angusto brunneis, dorsalibus 1-4 fascia apicali argenteo-pubescente; area pygidiali aureo-pubescente; alis hyalinis, venis ferrugineis. Long. 10 mm.

♀. Galea short, broader than long. Clypeus very broadly rounded at the apex, the front and clypeus clothed with silver pubescence. Eyes separated on the vertex by a distance slightly exceeding the length of the two basal joints of the flagellum. Thorax closely and minutely punctured, clothed with short greyish hairs, with short silver pubescence on the mesopleuræ. Median segment more than half as long again as the scutellum, very minutely punctured and clothed with short whitish hairs; the posterior slope with a deep longitudinal sulcus, which extends to the apex of the dorsal surface. Second ventral segment sub-opaque, very finely and closely punctured; third and following ventral segments shining, with a few scattered punctures. Pygidial area longer than the basal breadth, narrowly rounded at the apex. Basal joint of fore tarsus with five spines. Radial cell narrowly rounded at the apex, not reaching as near to the outer margin of the wing as the apex of the third cubital cell; second and third abscissæ of the radius subequal.

*Hab.* Meadi, Egypt (*Egyptian Department of Agriculture*), July.

This species bears a strong superficial resemblance to *Tachysphex fluctuatus*, Gerst.

*Tachytes rufiscutis*, sp. n.

♂. Niger; palpis, galea, mandibulis dimidio basalī, clypeo, antennis, prothorace pedibusque ferrugineis; mesonoto antice, scutello postscutelloque fusco-ferrugineis; tegulis testaceis; segmentis duobus apicalibus rufo-brunneis; alis flavo-hyalinis, venis ferrugineis.

Long. 18 mm.

♂. Galea scarcely longer than the scape, a little longer than its basal breadth; palpi not elongate. Head covered with whitish hairs, changing to pale golden on the clypeus. Vertex opaque, very finely punctured; eyes separated on the vertex by a distance scarcely equal to half the length of the second joint of the flagellum. Antennæ stout, the joints not arcuate beneath. Thorax opaque, finely and very closely punctured; median segment twice as long as

the scutellum, without a distinct median sulcus, but with a strong apical fovea, the posterior slope with a strong median sulcus. Abdomen closely and minutely punctured, rather sparsely clothed with very short silver-grey pubescence, which does not form apical fasciæ; second sternite very minutely and closely punctured on the sides, much more strongly and rather sparsely in the middle; the third and following sternites very sparsely and deeply punctured in the middle. Seventh tergite elongate-triangular, rather narrowly rounded at the apex, densely clothed with coarse reddish-gold pubescence. Eighth sternite rather narrowly truncate at the apex, the angles not produced. First recurrent nervure interstitial with the first transverse cubital nervure, second received just before the middle of the second cubital cell; third abscissa of the radius nearly twice as long as the second and about equal to the first. Six spines on the basal joint of the fore tarsus.

*Hub.* Mlanje, Nyasaland, 2300 ft. (*S. A. Neave*), October.

A very distinct species in colour, in the position of the first recurrent nervure, and in the even distribution of the pubescence of the tergites.

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#### XIV.—On *Barnacles of the Genus Scalpellum from Deep-sea Telegraph-Cables.* By W. T. CALMAN, D.Sc.

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DURING the last few years the British Museum (Natural History) has received collections of deep-sea animals taken from telegraph-cables raised for repair in the Atlantic and in Oriental seas. Most of these collections have been obtained by the cable-ships of the Eastern and Associated Telegraph Companies, and the Museum is indebted to Mr. Walter Judd, Electrician-in-Chief of these companies, who has taken much trouble to facilitate the collecting and safe transmission of the specimens. The Museum is not less indebted to the captains and other officers, and particularly to the medical officers of the various ships, by whom the collections were actually made and who have supplied exact details of the positions and depths at which the specimens were taken.

The following is a list of the ships by which the specimens described in this paper were obtained, and indicates the

companies to which they belong and the areas in which they were working. The companies belonging to the group of the "Eastern and Associated Telegraph Companies" are distinguished by an asterisk :—

C./S. 'Britannia.'	*Eastern Telegraph Company.	Cape Verde Ids.
'Electra.'	do. do.	Gulf of Aden.
'Sherard Osborn.'	do. do.	Java-Australia.
'Norseman.'	*Western Telegraph Company.	Brazil.
'Patrol.'	*Eastern Extension, Australia, and China Telegraph Company.	Java-Australia.
'Recorder.'	*Eastern Extension, Australia and China Telegraph Company.	Java Sea.
'Colonia.'	Telegraph Construction and Maintenance Company.	Aden-Zanzibar.
'Henry Holmes.'	West India and Panama Telegraph Company.	West Indies.

The bulk of the collections consists of sessile organisms that were actually attached to the cables, and among these the barnacles are conspicuous by their numbers and, in many cases, by their large size. One of the specimens of *Scalpellum nudipes* mentioned below is among the largest of the pedunculate Cirripedes yet recorded.

While some species of deep-sea Cirripedes are known to have a very wide distribution, occurring in the Atlantic, the Indian, and the Pacific Oceans, there is some evidence that certain species are confined to more restricted habitats. Thus, two of the species recorded below (*S. nudipes* and *S. persona*) have been only very recently described by Dr. Annandale from localities not far distant, and probably, indeed, from another part of the same cable.

The "new species" that are described here, like many of those already established in the genus *Scalpellum*, must not be taken too seriously. A large proportion of the known species of the genus have been described from solitary specimens or from a very few, and we are without the means for forming even the roughest estimate of the limits within which variation may occur. Further, even where a considerable number of specimens have been found growing side by side or attached to one another (as in the group of *S. bengalense* mentioned below), there is reason to believe that they may all belong to a single family, and that the uniformity of character which they show may be, in part, fraternal or filial rather than specific. At the same time

there is some evidence for the constancy of apparently trivial characters in specimens from widely remote localities. A striking example is afforded by *S. acutum*, of which I have been able to compare, side by side, specimens from the Kermadec Islands, the Gulf of Aden, and the Cape Verde Islands without finding any noteworthy differences.

The classification here adopted is that of Annandale (1910), who retains, in its full extent, the old genus *Scalpellum*, dividing it only into the two subgenera *Smilium* and *Scalpellum*, s. str. The criticisms of Annandale (1910, 1916) on the more elaborate schemes proposed by Hoek, by Pilsbry, and by Joleaud appear to be, on the whole, well founded.

### *List of Species.*

- Scalpellum (Smilium) trispinosum*, Hoek. Java Sea, 73-175 fath.  
 — (—) *nudipes*, Annandale. Java-Australia, 130-500 fath.  
 — (—) *acutum*, Hoek. Gulf of Aden, 1200 fath., and Cape Verde Ids., 990 fath.  
 — (—) *bengalense*, Annandale. Gulf of Aden, 260 fath.  
 — (*Scalpellum*) *ecaudatum*, sp. n. Java Sea, 73-175 fath.  
 — (—) *velutinum*, Hoek. Java-Australia, 400-700 fath., and Aden-Zanzibar, 600 fath.  
 — (—) *annandalei*, sp. n. Gulf of Aden, 1200 fath., and Java-Australia, 700 fath.  
 — (—) *regina*, Pilsbry. Pernambuco, 50-150 fath.  
 — (—) *regulus*, sp. n. Java-Australia, 800-1500 fath.  
 — (—) *alcockianum*, Annandale. Java-Australia, 700 fath.  
 — (—) *juddi*, sp. n. Java-Australia, 250-400 fath.  
 — (—) *persona*, Annandale. Java-Australia, 400 fath.  
 — (—) *portoricanum*, Pilsbry. Porto Rico, 180 fath.  
 — (—) *rubrum*, Hoek. Java Sea, 73-175 fath.  
 — (—) *novæ-zelandiæ*, Hoek. Gulf of Aden, 1200 fath.  
 — (—) *gruvelii*, Annandale. Gulf of Aden, 770-1200 fath.  
 — (—) *laccadicum*, Annandale. Java-Australia, 400 fath.

### *Scalpellum (Smilium) trispinosum*, Hoek.

*Scalpellum trispinosum*; Hoek, Rep. 'Challenger' Cirripedia, 1883, p. 72, pl. vi. figs. 15, 16.

*Calantica trispinosa*, Krüger, Abh. Akad. Wiss. München, math.-phys. Kl., Suppl. Bd. ii. Abh. 6, 1911, p. 11, pl. i. fig. 1, pl. ii. figs. 12, 13.

*Locality*.—Lat.  $7^{\circ} 35' S.$ , long.  $114^{\circ} 30' 30'' E.$  (Java Sea), 73-115 fath. C./S. 'Recorder.' 4 ♀, 1 ♂.

*Remarks*.—The specimens agree very closely indeed with the holotype, the largest exceeding it only a little in size (length of capitulum 15 mm.). The lines of growth on the valves are not so sharp or so conspicuous as in Hoek's figure. There is some variation as regards the acuteness of



the tergal apex, and the ocludent margins of both tergum and scutum may be either straight or concave. The carina has a broadly convex ridge in the middle of the roof, bordered by a shallow concavity on each side, and the parietes, which are broad above and narrow below, are inflected at a sharp angle. In a very small specimen (capitular length 4.5 mm.) the carina is more strongly curved than in larger specimens, and its apex, instead of projecting freely, enters between the terga.

Krüger's specimens reached a much larger size (capitular length 29 mm.), and, in some cases at least, the peduncle greatly exceeded the length of the capitulum.

The two subequal rami of the first cirrus have, in one specimen, 13 and 14 segments respectively; in the sixth cirrus the numbers are 21 and 19. The caudal appendages resemble those figured by Annandale for *S. nudipes*. The proportions of the penis and the structure of the mouth-parts agree in general with Krüger's account.

One of the hermaphrodites carried a single dwarf *male*, about 1.25 mm. in total length, wedged between the ocludent margins of the scuta on the outer surface of the adductor muscle. It differs considerably from Krüger's figure in having the valves of the capitulum much larger and more regularly formed. It resembles Darwin's figure of the male *S. villosum* ('Lepadidæ,' pl. vi. fig. 4), except that the strongly curved rostrum is much larger, the scutum more than twice as wide as the tergum, and the integument without conspicuous spines, in these respects approaching Annandale's figure of the male *S. nudipes*. On one side the base of the rostrum has been cracked, separating off a small plate similar to those found by Annandale on each side of the carina in the male of *S. nudipes*, and suggesting that the latter plates are also due to accident.

*Scalpellum (Smilium) nudipes*, Annandale.

*Scalpellum (Smilium) nudipes*, Annandale, Journ. Straits Branch Roy. Asiatic Soc. no. 74, 1916, p. 287, pl. iv. fig. 1, pl. v. figs. 1-6, pl. vi. figs. 1, 2.

*Locality*.—Lat. 10° 22' 30" S., long. 120° 7' 30" E. (Java-Australia), 130-500 fathoms. 1 ♀, 1 ♂\*.

\* This specimen, transferred to the Museum some years ago from the Netley Hospital collection, bears on the label exactly the indications of position and depth given by Annandale for the holotype, with the additional information that, as he suspected, the latitude is south of the line. It may be assumed, therefore, that this specimen also formed part of the collection made by Capt. F. Worsley of the C./S. 'Sherard Osborn.'

Lat.  $11^{\circ} 0' S.$ , long.  $121^{\circ} 30' E.$  (Java-Australia), 400 fathoms. C./S. 'Patrol.' 1 ♂.

*Remarks.*—The second of the two hermaphrodite specimens recorded above measures 63 mm. in length of capitulum by 47 mm. in breadth, and the peduncle is 87 mm. long by about 29 mm. in diameter in the middle. These dimensions are considerably greater than those recorded by Annandale, and show that the species reaches a size not exceeded, if it be attained, by any other member of the genus.

Certain slight differences from Annandale's description are shown by both specimens. The occludent basal angle of the tergum is by no means acute, but, as shown in Annandale's figure, clearly obtuse. The apices of both tergum and scutum may be straight or slightly recurved. The median latus (called inframedian and sometimes upper by Annandale) is quadrangular, not triangular; its posterior (or carinal) angle does not "dive beneath the carina," but is broadly truncated, forming a side, the shortest of the four, parallel to the margin of the carina. The apex of the carina is free for a short distance in one specimen, but not in the other; the roof is bluntly ridged in the middle and flat or faintly concave on each side; the parietes are very narrow and inflected. The basal half of the carina is straight in one specimen, gently curved in the other.

The first cirrus has the rami unequal in length, but with about the same number of segments (20 : 21 in one specimen). The penis is laterally compressed in one specimen, as in Annandale's description, but in the other it is swollen; it does not exceed one-half the length of the sixth cirrus.

Annandale states that this species "would find a place in the genus *Calantica* as redefined by Pilsbry in 1908." Pilsbry based the separation of *Calantica* from *Smilium* on the fact that in the former genus there is "no plate interposed below the tergum between scutum and carina," stating that "in other characters the two groups are almost identical." Presumably, therefore, Annandale's remark was suggested by his impression of the median latus as triangular in form, with its posterior angle overlapped by the carina. As shown above, however, this plate is distinctly quadrilateral, and it is interposed, as clearly as possible, between the scutum and the carina. *Scalpellum nudipes* is, indeed, well fitted to show that the distinction between *Calantica* and *Smilium*, as defined by Pilsbry, is of little importance (as Pilsbry himself acknowledges), and that Annandale was justified in disregarding it. Dr. Annandale goes on to say, "In spite of the absence of

an upper latus in the hermaphrodite it seems to me to be probably related to such forms as *Scalpellum stratum*, Aurivillius, from the West Indies, and *S. sinense*, Annandale, from the seas of Burma and China." The affinity of *S. nudipes* with *S. sinense* is at once evident on comparing the excellent figures that Annandale has given of both species, but I am at a loss to understand the reference to *S. stratum*. In that species, as figured by Aurivillius, there are two median latera, the "upper latus" and the "inframedian latus"; in the present species, as in *S. sinense*, there is only one, whatever its proper designation may be.

*Male*.—A very small specimen was attached between the scuta below the level of the adductor muscle in the Netley Hospital specimen. It is less than half the size of the young male figured by Annandale, the capitulum measuring 1.1 mm. in length, and it carries to a greater degree the elongation of the capitulum which Annandale found to distinguish the young from the adult male, the breadth being only 0.7 mm. It further differs very remarkably in having only five calcified valves, there being no trace of a rostrum. The peduncle, about 0.6 mm. in length, is clothed with long setæ which are most numerous on the carinal side. The internal structure is not well preserved, but the mandible can be seen to have only three teeth besides the inner angle; there are six pairs of cirri and a short penis, and the caudal appendages are minute, unjointed, with two or three long apical setæ.

If this be really an earlier stage in the development of the male than those figured by Annandale—and there seems to be no reason to doubt that it is—it infringes in a very significant fashion the rule that "in all known males of the genus in which the calcareous armature is not degenerate there are six valves" (Annandale, *t. c.* p. 286). It would seem to indicate, in fact, that the rostrum forms no part of the "primitive armature," which is thus reduced to that typical of the family Lepadidae.

### *Scalpellum (Smilium) acutum*, Hoek.

*Scalpellum acutum*, Hoek, Rep. 'Challenger' Cirripedia, 1883, p. 80, pl. iii. fig. 19, pl. viii. fig. 12; id. 'Siboga' Exp. Cirripedia Pedunculata, 1907, p. 64, pl. vii. fig. 1.

*S. (Smilium) acutum*, Annandale, Rec. Ind. Mus. v. 1910, p. 154; id. Mem. Ind. Mus. vi. 1916, p. 129, pl. vii. fig. 4.

*S. longirostrum*, Gruvel, Bull. Mus. Paris, vi. 1900, p. 190; Exp. 'Travailleur' et 'Talisman,' Cirrhipèdes, 1902, p. 70, pl. ii. figs. 4, 5, pl. iii. figs. 17-21.

*Localities.* Lat.  $14^{\circ} 54'$  N., long.  $23^{\circ} 42'$  W. (Cape Verde Ids.), 990 fath. C./S. 'Britannia.' 2 ♂.

Lat.  $14^{\circ} 20'$  N., long.  $52^{\circ} 30'$  E. (Gulf of Aden), 1200 fath. C./S. 'Electra.' 5 ♀ (N. Annandale det.).

*Remarks.* The seven specimens differ in no noteworthy respect from one another or from a specimen from 'Challenger' Station 170 (near Kermadec Islands), which is the sole survivor of the four syntypes. I find no reason to dissent from the conclusion of Hoek and Annandale that Gruvel's *S. longirostrum* is a synonym of this species, although in none of the specimens examined is the subcarina so tall as in Gruvel's figure. Two of our specimens, in which the capitulum measures 12 mm. in length, are twice as large as any hitherto recorded. The penis is short and the caudal appendages appear to be entirely wanting.

*Scalpellum (Smilium) bengalense*, Annandale.  
(Text-fig. 1.)

*Scalpellum bengalense*, Annandale, Ann. & Mag. Nat. Hist. (7) xvii. 1906, p. 395; id. Illustr. Zool. 'Investigator,' Crust. Entom. pl. i. fig. 5, 1907; Stewart, Mem. Ind. Mus. iii. 1911, p. 44, pl. vi. figs. 7, 10.

*S. (Smilium) bengalense*, Annandale, Rec. Ind. Mus. v. 1910, pp. 147, 153, text-fig. 1; id. Mem. Ind. Mus. vi. 1916, p. 129, pl. vi. figs. 3, 4, pl. vii. fig. 3, pl. viii. figs. 1-5.

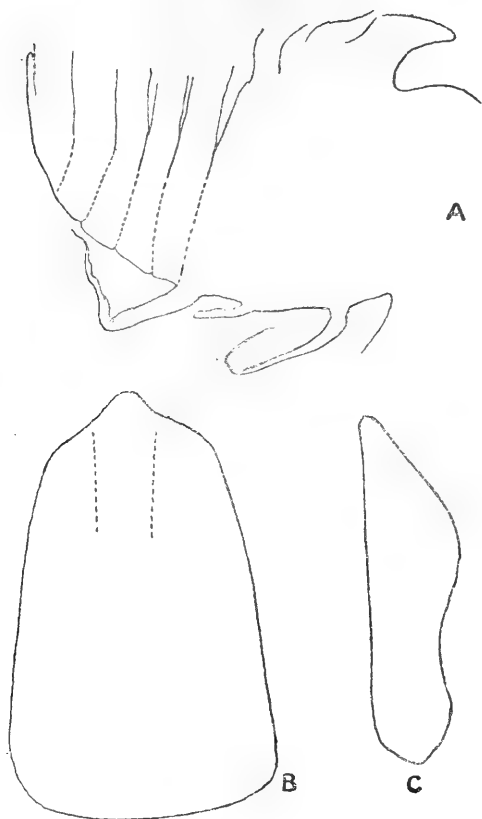
*Locality.* Lat.  $12^{\circ} 43'$  N., long.  $45^{\circ} 17'$  E. (Gulf of Aden), 260 fath. C./S. 'Colonia.' About 50 ♀, 3 ♂.

*Remarks.* Annandale has called attention to the resemblance which the hermaphrodite individuals of this species bear to those of *S. squamuliferum* Weltner—a resemblance so close that they "might almost have been considered specifically identical,"—while the males of the two species are remarkably different. The material now examined confirms this general statement, but shows that the distinguishing characters as given by Annandale require some modification.

*Scalpellum bengalense* was originally described from eight syntypes and the length of the capitulum was given as 10 mm. Annandale later stated that the type-specimens were immature and described "adult" specimens, but did not indicate their size; measurements taken from his figure published in 1916 show the capitular length to be about 14 mm. The statement as to the "immaturity" of the original specimens requires qualification. The British Museum received from

the Indian Museum in 1906 a specimen labelled "Ganjam Coast, 98-102 fathoms, Station 106, Marine Survey," and, although it is not so stated on the label, there can be little doubt that it is one of the eight syntypes. This specimen

Fig. 1.



*Scalpellum bengalense.*

A. Syntype. Outline of body, from the side, to show the dorsal filamentary appendages. B. Carina, C. Scutum, of male specimen.

measures only 9 mm. in length of capitulum, but it carries a mass of about 40 eggs in the mantle cavity; it is, therefore, sexually mature, although it has by no means attained

the full size or the definitive characters of the species. The present collection includes a number of specimens exceeding 20 mm. and one which measures 24 mm. in length of capitulum, and these differ considerably in general appearance from the small syntype.

For comparison I have examined a considerable series of *Scalpellum squamuliferum* from the Bay of Bengal, received from the Indian Museum, and four specimens—determined by Gruvel and mentioned by Annandale—stated to come from Singapore. The results of this comparison, as regards the hermaphrodite individuals, may be briefly stated as follows:—

*S. bengalense*. Valves thinner, separated by distinct interspaces, cuticular covering less opaque. Upper latus with basal margin about as long as the scutal and two-thirds or more of width of scutum, with scuto-tergal angle less acute ( $75^{\circ}$ – $90^{\circ}$ ). Inframedian latus rhomboidal, hardly wider than high. Rostrum straighter as seen from side. Carina narrower, its width at base less than one-sixth of its length. Peduncle much less strongly annulated, the ridges separated by narrow and shallow grooves. Scelerites of peduncle ovoid or pyriform nodules, rarely more than twice as long as wide, arranged in oblique rows ascending from rostral to carinal side of peduncle and more or less interrupted on carinal side; even in large specimens these rows, while less regular than in small specimens, are not altogether masked by the transverse annulations. Dorsal filamentary appendages usually three in number, sometimes two, or (*teste* Annandale) absent.

*S. squamuliferum*. Valves thicker, all in contact or nearly so, cuticle more opaque. Upper latus with basal margin one-half to two-thirds as long as scutal, and more than one-half of width of scutum, with scuto-tergal angle more acute ( $50^{\circ}$ – $65^{\circ}$ ). Inframedian latus nearly triangular and about twice as wide as high. Rostrum more curved. Carina wider, its width at base more than one-fifth of its length. Peduncle strongly annulated, the ridges separated by deep grooves which, in places, are wider than the ridges. Scelerites rod-shaped, up to five times as long as thick, crowded together on the ridges and absent from the furrows, so that the arrangement in oblique rows seen in the young is absent or obscured in large individuals; the

interruption of the rows on the carinal side is never extensive. Two dorsal filamentary appendages.

As regards the filamentary appendages, which Annandale calls "ovigerous lamellæ," and which he states are absent in *S. bengalense*, their presence in the syntype above mentioned and in the ten other specimens dissected shows that their absence must be considered exceptional. In the syntype (fig. 1, A) and in eight of the other specimens there are three of these filaments depending from the tergal surface of the prosoma, a short one being interposed between the two longer and nearer to the posterior one. In one specimen the short process is reduced to a papilla, and in another the posterior filament gives off two short branches near its base. In two specimens the two long filaments alone are present as in *S. squamuliferum*. Some half-dozen specimens of the latter species were examined as to this point, and all agreed with Annandale's description and figures.

In none of our specimens of either species is the peduncle much longer than the capitulum.

The *males*, of which only three specimens (two on one hermaphrodite) were found, agree very well in general form with Annandale's figure of 1910, less well with that of 1916 or with Stewart's figure of 1911. With regard to the valves of the capitulum, Annandale's description runs, "Capitulum entirely without calcified valves, or with a pair of amorphous scuta, or occasionally with minute terga in addition to such scuta" (Annandale, 1910, p. 154). Two of our specimens were removed for examination and found to disagree with this account. They show no signs of terga, but possess a pair of scuta (fig. 1, C) which by no means deserve the epithet "amorphous," and, in addition, a large and symmetrically-developed carina (fig. 1, B). The whole surface of capitulum and peduncle is covered with setæ arranged in regular transverse rows. Over the greater part of the surface these setæ are uniformly short, but towards the carinal side of the capitulum they become lengthened, forming a thick brush running along each margin of the carina but not covering the carina itself. This brush is roughly indicated in Annandale's figure of 1910.

The males were attached close to the margin of the scutum, external to the adductor muscle and just below a fold of cuticle which forms the lower lip of the mantle-opening. The slender peduncle is curved upwards and backwards over this lip, so that the body of the male projects into the mantle-

cavity and lies on the upper surface of the adductor. In *S. squamuliferum* the males which I have examined were attached in the fossa between the margins of the two scuta, external to or below the adductor muscle\*.

*Scalpellum (Scalpellum) ecaudatum*, sp. n. (Text-fig. 2.)

*Locality.* Lat.  $7^{\circ} 35'$  S., long.  $114^{\circ} 30' 30''$  E. (Java Sea), 73–175 fath. C./S. 'Recorder.' 1 ♀ (holotype).

*Description.*—*Capitulum* compressed, rather elongated. *Valves* 14, all in contact, covered with a thin cuticle which does not conceal the sculpturing and carries minute setæ scattered, for the most part, in rows along the lines of growth. All the valves boldly sculptured with ribs radiating from the umbones; the lines of growth marked by fine and inconspicuous striæ. *Tergum* rather more than twice as long as wide, occludent margin straight, scutal margin nearly so, carinal margin convex, becoming straight or faintly concave near the acute apex. *Scutum* twice as long as wide, occludent margin convex, other margins straight, apex slightly overlapping tergum. *Carina* less than five times as long as it is wide at the base, evenly curved, with the umbo apical, entering between the terga, with a flat roof bordered by strong ridges; parietes rather deep, sloping inwards. *Upper latus* quadrangular, scutal margin very slightly concave, longer than the others, which are straight. *Rostrum* small, triangular, overlapped at sides by rostral latera. *Rostral latus* more than three times as wide as it is high, with a pair of horizontal ribs converging to the umbo. *Inframedian latus* very narrow, the sides converging to the umbo, then diverging slightly in a small apical extension beyond. *Carinal latus* with the recurved umbo projecting behind and to the side of the carina; the convex margin below the umbo less than half as long as the straight margin above it which abuts against the carina; the two latera meet below the square base of the carina (fig. 2, B).

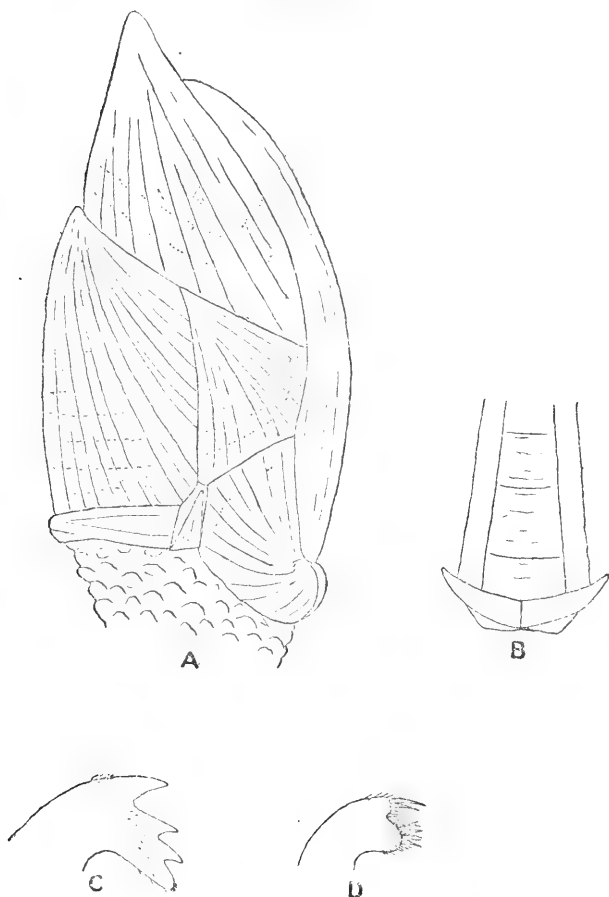
*Peduncle* a little shorter than capitulum, closely set with imbricated scales in about 14 longitudinal rows of 11 scales each.

\* The statements as to the place of attachment of the males in the genus *Scalpellum* in my account of the Crustacea in Lankester's 'Treatise on Zoology' (pt. vii. fasc. 3, p. 119) are, unfortunately, misleading. The less-modified males are, as a rule, attached in the position described above for *S. squamuliferum*. The more highly modified males are usually lodged in fossettes on the scutal margins. I know of no case where they are placed far within the mantle-cavity in this genus.



*Mandible* (fig. 2, C) with four teeth (including inner angle), the interval between the two distal nearly twice that between the two proximal teeth. *Maxillula* (fig. 2, D) with inner edge

Fig. 2.



*Scalpellum ecaudatum*, holotype.

A. Capitulum, from the side. B. Base of carina and carinal latera.  
C. Mandible. D. Maxillula.

concave or notched below a distal group of strong spines. *First cirrus* with rami unequal, of 9 and 11 segments, exopod

not greatly expanded. *Sixth cirrus* with rami of about 22 segments, middle segments bearing four pairs of spines anteriorly and a group of long distal setæ posteriorly; no conspicuous spines or setæ on inner face of endopod segments. *Caudal appendages* absent. *Penis* absent. No males were found.

*Measurements.* Length of capitulum 13.0 mm., breadth 7.0 mm.; length of peduncle 10 mm., diameter 4.5 mm.

*Remarks.* In Hoek's classification of the genus this species would find a place in the section (or subgenus) *Arcoscalpellum* and in "Group c," of which *S. hamatum* is the type. From most of the species forming this group it is distinguished by the strongly ribbed valves, resembling in this respect some species of Hoek's "Group d" (*S. formosum*, &c.); but it appears to be separated from all the members of both groups by the very low rostro-lateral plates. The structure of the appendages does not appear to have been described in any closely related species, but the complete absence of caudal appendages is, at all events, very unusual in the genus. Gruvel mentions, as the only example of this deficiency, the widely different *S. villosum*, and to this, as mentioned above, the hardly less different *S. acutum* must now be added.

*Scalpellum (Scalpellum) velutinum*, Hoek.

*Scalpellum velutinum*, Hoek, Rep. 'Challenger' Cirripedia, 1883, p. 96, pl. iv. figs. 10, 11, pl. ix. figs. 7-9; Gruvel, Exp. 'Travailleur' et 'Talisman,' Cirrhipèdes, 1902, pp. 56, 136, pl. ii. figs. 3 c, 14, pl. iii. figs. 1, 27-31, pl. iv. figs. 6, 11-22; Pilsbry, Bull. U.S. Nat. Mus. ix. 1907, p. 26, pl. iii. figs. 2, 3; Annandale, Illustr. Zool. 'Investigator,' Crust. Entom. pl. iv. fig. 7 (1908); id. Rec. Indian Mus. ix. 1913, p. 229.

*S. eximium*, Hoek, Rep. 'Challenger' Cirripedia, 1883, p. 100, pl. iv. figs. 6, 7, pl. ix. figs. 10, 10\*.

*S. sordidum*, Aurivillius, Bull. Soc. Zool. France, xxiii. 1898, p. 190.

*S. alatum*, Gruvel, Bull. Mus. Paris, vi. 1900, p. 192.

*Localities.* Lat. 8° 46' S., long. 114° 44' E. (Java-Australia), 400 fath. C./S. 'Recorder.' 1 ♀.

Lat. 10° 45' S., long. 120° 50' E. (Java-Australia), 700 fath. C./S. 'Patrol.' 1 ♀.

Lat. 11° 0' S., long. 121° 30' E. (Java-Australia), 500 fath. C./S. 'Patrol.' 3 ♀.

Lat. 11° 0' S., long. 122° 0' E. (Java-Australia), 600 fath. C./S. 'Patrol.' 3 ♀.

Aden-Zanzibar cable, about 600 fath. C./S. 'Colonia.' 1 ♀.

*Remarks.* Gruvel and other writers have already admitted a considerable range of variation in the characters of this species, and I therefore record as belonging to it a number of specimens which differ a good deal from one another and from the holotype. Most of the specimens group themselves round Hoek's paratypes from Cape St. Vincent, and with this series the holotype of *S. eximium* may be associated, as well as most of the specimens described or figured by later authors. The holotype of *S. velutinum* differs especially in having much more numerous, narrower, and more closely set peduncular scales. In addition, the tergum is longer and narrower, the scuto-tergal angle of the upper latus is more acute (about  $47^{\circ}$ ), and that valve has no portion of its convex base touching or opposed to the carina.

The specimen recorded above from lat.  $10^{\circ} 45'$  S., long.  $120^{\circ} 50'$  E., differs a good deal from all the others, and is only placed here with some doubt. The width of the carina at the base is hardly more than one-fifth of its length, and the marginal ridges of the roof are wanting altogether in the lower half and only slightly marked towards the apex. The upper latus has the scuto-tergal angle less acute (about  $70^{\circ}$ ), and the curved basal margin extends upwards alongside the carina for some distance, the tergum being correspondingly shorter.

In all the specimens the caudal appendages are rather stout and do not differ greatly in length from the peduncle of the sixth cirrus. They seem to consist of from four to six segments, but, as Gruvel notes, some of the seven or eight segments which he counts are very indistinct. The carina is by no means always, as Pilsbry states, "squarely truncate" below; in many specimens it is rounded or even, as in the holotype of Hoek's *S. eximium*, distinctly angled. In none of our specimens is there any trace of a penis.

Annandale's record from 1200 fathoms (Rec. Ind. Mus. ix. 1903, p. 230) refers, as shown below, not to this but to the next species.

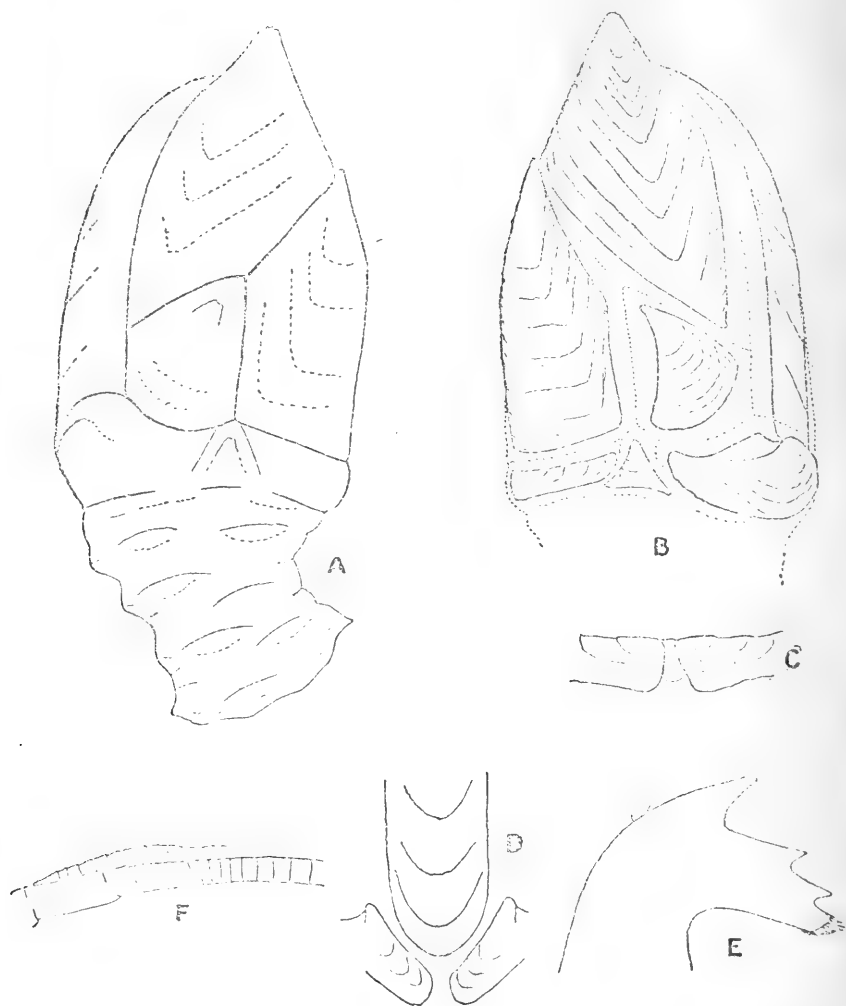
*Scalpellum (Scalpellum) annandalei*, sp. n.  
(Text-fig. 3.)

*Locality.*—Lat.  $14^{\circ} 20'$  N., long.  $52^{\circ} 30'$  E. (Gulf of Aden), 1200 fath. C./S. 'Electra.' 1 ♂ (holotype).

Lat.  $10^{\circ} 45'$  S., long.  $120^{\circ} 50'$  E. (Java-Australia), 700 fath. C./S. 'Patrol.' 1 ♂ (paratype).

*Description.*—*Capitulum* oblong-oval, its height more than

Fig. 3.



*Scapellum annandalei*, holotype.

- A. Lateral view before removal of cuticle. B. Capitulum with cuticle removed to show outline of calcareous valves. C. Rostrum and rostral latera. D. Base of carina and carinal latera. E. Mandible. F. Base of sixth cirrus and caudal appendage.

half as great again as its width, the 14 valves covered with opaque cuticle, only the umbones exposed (fig. 3, A), the surface with a very short velvety pile; on removing the cuticle the valves are seen to be separated by rather wide chitinous interspaces (fig. 3, B). *Tergum* quadrilateral, with nearly straight sides, about twice as long as wide, with rather widely spaced and not very prominent lines of growth, and with a faint ridge running from the apex to the basal angle; the straight ocludent margin forms a slight angle with that of the scutum. *Scutum* triangular, with the inner margin obtusely angled about its middle, so that the valve becomes almost quadrilateral, about twice as high as it is wide, apex very slightly recurved, ocludent margin slightly convex. *Carina* simply bowed, nearly straight in its lower half, umbo apical, touching but not entering between the terga, lower end rounded, more or less widely separated from carinal latera (fig. 3, D); roof strongly convex, not defined from the parietes. *Upper latus* triangular, with umbo at the acute scuto-tergal angle, basal and tergal margins convex, scutal margin concave. *Rostral latera* (fig. 3, C) very low, apices incurved, separated by the minute *rostrum*. *Infra-median latus* small, triangular, about as high as it is wide at the base. *Carinal latus* much wider than high, not projecting behind the carina, umbo at upper end, a more or less distinct ridge extending from umbo to inner angle. The two carinal latera do not meet behind (fig. 3, D).

*Peduncle* short, with large plates, not imbricated, arranged in six longitudinal rows of about five plates each. Free margins of plates rounded except in the carinal series, where they are bluntly angled.

*Mandible* (fig. 3, E) with four teeth (including inner angle), the interval between the two distal twice that between the second and third. *Cirri* purplish or greenish. *First cirrus* with rami of about 9 and 14 segments. *Sixth cirrus* with rami of about 36 segments which about the middle bear three pairs of long spines anteriorly with a few finer setæ between. *Caudal appendages* (fig. 3, F) in holotype less than twice as long as peduncle of sixth cirrus, with 13 segments, in paratype more than twice as long as peduncle and with 25 segments. *Penis* about as long as caudal appendages, tapering, without conspicuous setæ.

*Measurements*.—Length of capitulum 20 mm., breadth 12.5 mm.; length of peduncle 11 mm., diameter 7 mm.

*Remarks*.—This species belongs to the group *Arco-scalpellum*, and by its wide carinal latera with the umbo

near the upper margin, its valves separated by wide interspaces, and its carina with a rounded roof it is brought into proximity with such forms as *S. giganteum*, Gravel. From that species it is separated by the narrower and more oblong form of the capitulum with straighter carina, by the differently shaped carinal latus with the upper angle not above the level of the umbo, and by the long and many-jointed caudal appendages.

The specimen described as the holotype formed part of a small collection which was kindly determined for the British Museum some years ago by Dr. Annandale. By some mischance, which cannot now be explained, the specimen was returned bearing the label "*S. velutinum*," although its distinctness from that species seems obvious to a much less practised eye than Dr. Annandale's. Unfortunately the record has been published by Dr. Annandale (Rec. Ind. Mus. ix. 1913, p. 230). The paratype, although from a widely distant locality, agrees very closely with the holotype in external characters. It differs, however, in having the caudal appendages longer and composed of a larger number of segments.

It is possible that the specimen figured by Hoek in his 'Siboga' Report (p. 85, pl. vii. fig. 13) as *S. moluccanum* belongs to the species here described. The figure, however, shows the capitulum to be a good deal wider, and some details of the valves can hardly be reconciled with the specimens examined by me. The true *S. moluccanum*, as represented by the holotype in the 'Challenger' collection, is widely different from the present species; it has the roof of the carina angled in the middle and separated by well-marked angles from the parietes, the valves all in contact or nearly so, the rostral latera much deeper, and the caudal appendages of seven segments.

*Scalpellum (Scalpellum) regina*, Pilsbry.

*Scalpellum regina*, Pilsbry, Bull. U.S. Nat. Mus. lx. 1907, p. 31, pl. ii. figs 4-6.

*Locality*.—Lat.  $7^{\circ} 37' S.$ , long.  $34^{\circ} 26\frac{1}{2}' W.$  (off Pernambuco), 50-150 fath. C./S. 'Norseman.' 2 ♀.

*Remarks*.—In general these specimens agree so closely with Pilsbry's description and figures that there can be little doubt that they belong to the species described by him. The most conspicuous difference is the greater width of the scutum, which is not twice as long as wide ( $16 \times 29$  mm.).

The carina of one specimen shows faint traces of marginal ridges to the roof. The rostral latus, and especially the inframedian latus, are wider than the figure, the latter valve being about twice as wide as high.

Pilsbry does not describe any of the appendages. The *mandible* has four teeth, the interval between the two distal less than twice that between second and third. The *cirri* are pale. The *first cirrus* has rami not very unequal, with 18 and 20 segments, and the exopod is slender in its distal third. The *sixth cirrus* has 36 segments in the exopod, with five pairs of spines on the middle segments. The *caudal appendages* are about half as long as the sixth cirrus, with 26–30 segments. The *penis* is slightly longer than the caudal appendages, slender, tapering, with a few scattered setæ on its distal part.

*Scalpellum (Scalpellum) regulus*, sp. n. (Text-fig. 4.)

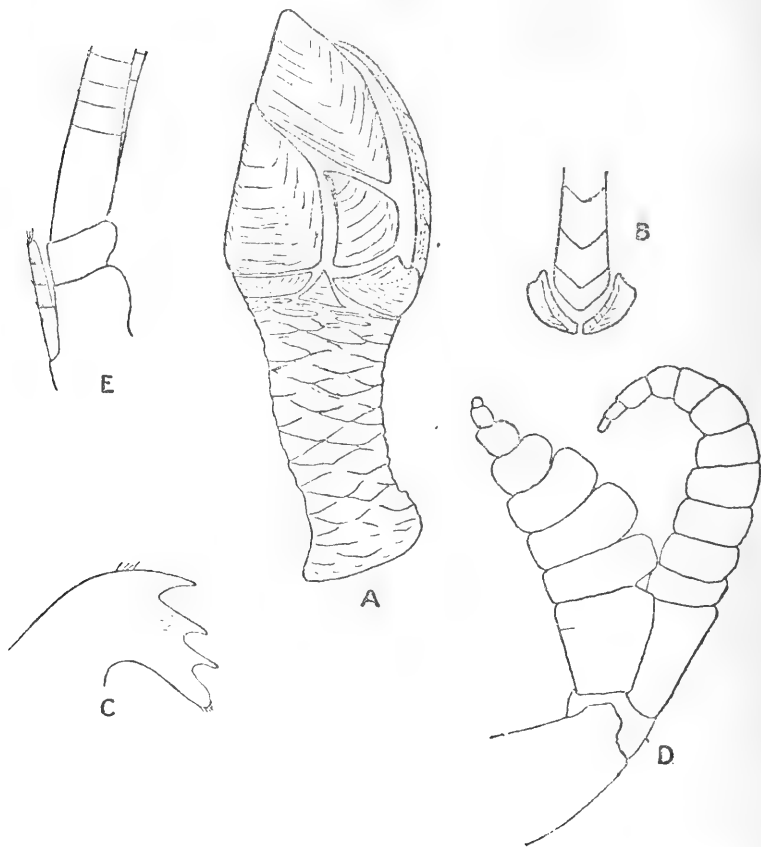
*Locality*.—Lat.  $9^{\circ} 15' S.$ , long.  $115^{\circ} 10' E.$  (Java-Australia), 800–1500 fath. C./S. 'Patrol.' 2 ♀.

*Description*.—Resembling *S. regina*, Pilsbry. Valves covered with opaque velvety cuticle with only the umbones exposed; separated from each other by rather wide chitinous interspaces; with well-marked but not prominent and rather widely-spaced lines of growth. *Tergum* nearly twice as long as wide, occludent margin straight, carinal margin strongly and scutal margin slightly convex; no distinct apico-basal ridge. *Scutum* less than twice as long as wide, occludent margin nearly straight, lateral margin convex, passing without marked angle into the straight tergal margin; apex acuminate, slightly recurved. Carina arcuate throughout its length, less than six times as long as wide at base; umbo apical, entering between terga, roof slightly convex, without marginal ridges, parietes very narrow, at right angles to roof, base rounded or angled. *Upper latus* with tergal margin convex and scutal margin concave, so that the acute apex is turned forwards; carino-basal margin convex, forming an almost even curve. *Rostrum* very small, triangular, separating the rostral latera. *Rostral latus* low, with an oblique ridge from the umbo. *Inframedian latus* triangular, nearly equilateral. *Carinal latus* shaped much as in *S. regina*, but with umbo closely appressed to, and not projecting behind, the carina (fig. 4, B).

*Peduncle* about as long as capitulum, with large overlapping scales arranged in 10–12 rows of 11–13 scales each.

*Mandible* (fig. 4, C) with four teeth, interval between the two distal only a little greater than that between second and third. *Cirri* purplish, lighter towards the tip. Rami of

Fig. 4.



*Scalpellum regulus*, holotype.

- A. Lateral view, with cuticle removed from capitulum. B. Base of carina and carinal latera. C. Mandible. D. First cirrus (setae omitted). E. Base of sixth cirrus and caudal appendage.

*first cirrus* (fig. 4, D) with 8 and 12 segments, exopod not very slender distally. *Sixth cirrus* with about 30 segments in exopod, with five pairs of spines on middle segments.



*Caudal appendages* (fig. 4, E) equal to or a little longer than peduncle of sixth cirrus, of 4 or 5 segments. *Penis* absent.

*Measurements*.—Length of capitulum 36 mm., breadth 22 mm.; length of peduncle 35 mm., diameter 13 mm.

*Remarks*.—Regarding only the characters of the capitular plates, the differences separating this species from *S. regina* are so little marked as hardly to suffice for the discrimination of the species. The most important, perhaps, are the form of the upper latus, with its acute and curved apex, and the less projecting umbo of the carinal latus. The value of these differences, however, is greatly enhanced by the very striking differences shown by the appendages. The mandible has a relatively smaller interval between the distal teeth; the cirri are shorter and the rami of the first cirrus have fewer segments; the caudal appendages are very short and composed of few segments, and the penis is absent. In certain characters, such as the form of the upper latus and the number of segments in the cirri and caudal appendages, the species approaches *S. regium*, but it differs widely from it in the form of the carinal latus, which in that species is much higher and has an apical umbo.

*Scalpellum (Scalpellum) alcockianum*, Annandale.

*Scalpellum alcockianum*, Annandale, Ann. & Mag. Nat. Hist. (7) xvii. 1906, p. 392; id. Illustr. Zool. 'Investigator,' Crust. Entom. pl. i. fig. 2, pl. ii. figs. 2-2 b (1907); id. Rec. Ind. Mus. ix. 1913, p. 229; id. Mem. Ind. Mus. vi. 1916, p. 129, pl. vi. figs. 5-5 b.

*Locality*.—Lat.  $10^{\circ} 45'$  S., long.  $120^{\circ} 50'$  E. (Java-Australia), 700 fath. C./S. 'Patrol.' 1 ♂.

*Remarks*.—The specimen, which has almost exactly the dimensions recorded by Annandale except that the peduncle is a little longer, agrees very well with a somewhat smaller specimen received from the Indian Museum, and apparently one of the syntypes. In both specimens the capitulum is inflated in its upper part, less strongly in the syntype than in the new specimen, where the main swelling seems to be over the areas between the tergum and neighbouring valves; the swelling is not due to a thickening of the wall, but to an expansion of the mantle-cavity.

In the present specimen the calcareous valves are rather more widely separated than in the syntype, the ocludent margins of terga and scuta form an even curve rather than a projecting angle, and the upper latus has its scutal margin more concave. In both specimens the scutum is more than

twice as long as its basal width. In the new specimen the mandible has the proximal tooth more produced and acute than in Annandale's figure and the interval between it and the second equal to that between the second and third teeth; there is no accessory tooth on the inner margin of the distal tooth. The rami of the first cirrus have 10 and 15 segments and the caudal appendages, which are little less than half as long as the sixth cirri, have about 22 segments. No males are attached to either specimen.

In Annandale's key to the Indian species of the subgenus *Scalpellum* (Rec. Ind. Mus. ix. 1913, p. 228) the entry relating to this species should apparently read "margins of tergum moderately excavated," instead of "not excavated."

*Scalpellum (Scalpellum) juddi*, sp. n.

(Text-figs. 5, 6, 7.)

*Localities*.—Lat.  $11^{\circ} 0'$  S., long.  $121^{\circ} 30'$  E. (Java-Australia), 400 fath. C./S. 'Patrol.' 1 ♀ (holotype).

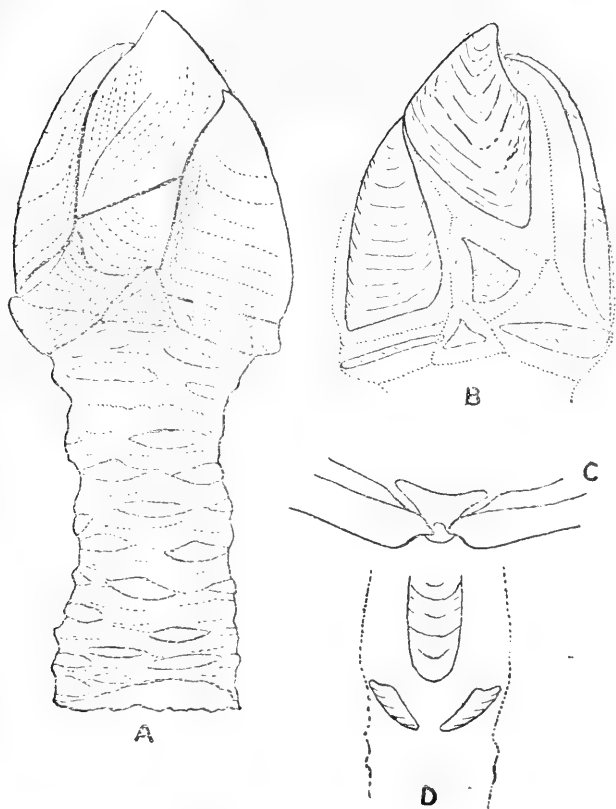
Lat.  $10^{\circ} 25'$  S., long.  $120^{\circ} 8'$  E. (Java-Australia), 250 fath. C./S. 'Patrol.' 1 ♀ with ♂♂ (paratype).

*Description*.—*Female*. *Capitulum* compressed, oval, notched above, with 14 calcareous valves embedded in—and, except at the umbonæ, entirely concealed by—a thick cartilaginous layer. On the outer surface, which is covered with a very short velvety pubescence, the areas of the valves are defined by grooves and the lines of growth are strongly marked (fig. 5, A). On paring away the cartilaginous layer the calcareous valves are seen to be widely separated, but with the margins not markedly excavated and with the lines of growth shallow and rather widely spaced (fig. 5, B). The following description applies to the calcareous valves, not to the superficial areas, except where the latter are mentioned.

*Tergum* irregularly triangular, apex projecting above that of carina, recurved; carinal margin angled above the middle, upper portion concave, lower straight or slightly convex; scutal margin slightly sinuous; occludent margin slightly convex, forming an even curve with margin of scutum. *Scutum* triangular, basal width more than half its height, apex overlapping tergum, occludent margin slightly convex, other two sides nearly straight, inner angle rounded. *Carina* evenly curved, its apex projecting freely for a short distance and touching or entering between the terga, its base rounded and widely separated from carinal latera; roof strongly convex, defined by a slight ridge on each side from the

narrow parietes (holotype) or slightly convex, forming prominent angles with the parietes (paratype). *Upper latus* triangular, base convex, scutal margin very slightly concave. *Rostrum* (fig. 5, C) a horizontal triangular plate, deeply

Fig. 5.

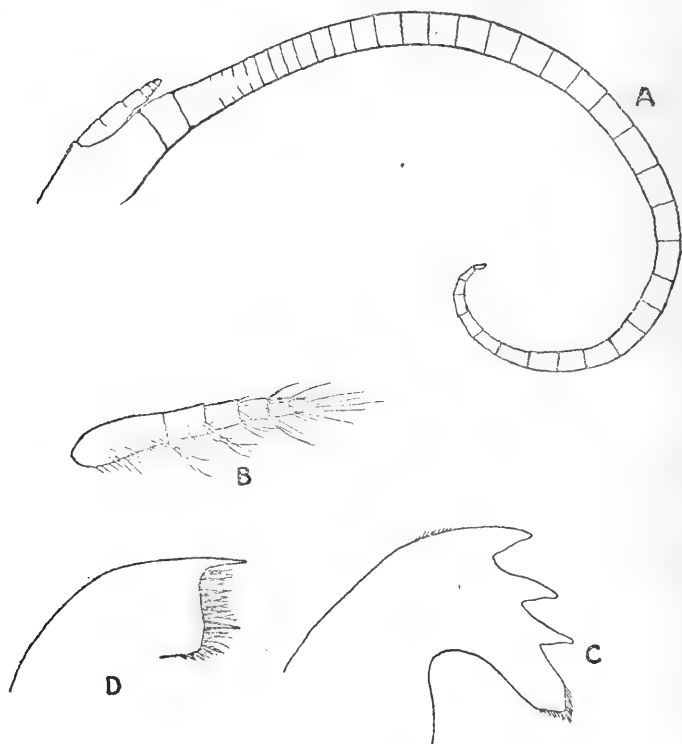
*Scalpellum juddi*, holotype.

A. Lateral view before removal of cuticle. B. Capitulum with cuticle removed to show outline of calcareous valves. C. Rostrum and rostral latera. D. Base of carina and carinal latera.

embedded, overlapped by rostral latera. *Rostral latus* also nearly horizontal, so that hardly more than the edge is seen in lateral view; apices incurved and separated only by apex

of rostrum. *Inframedian latus* small, triangular, set obliquely with the apex near the surface and the base deeply embedded. *Carinal latus* also set obliquely, much broader than high, with umbo in line with upper margin, recurved and slightly projecting laterally but hardly posteriorly, not meeting its fellow below the carina (fig. 5, D). The outline of the carinal

Fig. 6.



*Scalpellum juddi*, holotype.

- A. Exopod of sixth cirrus and caudal appendage (setae omitted).  
 B. Caudal appendage. C. Mandible. D. Maxillula.

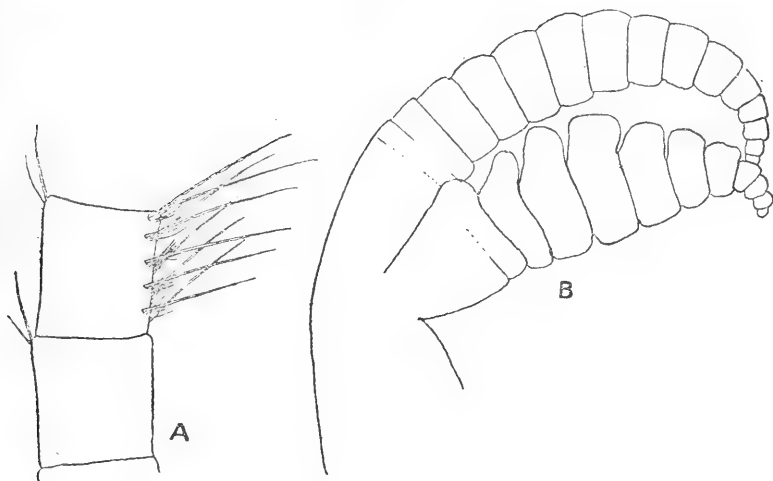
*latus* as defined by grooves on the external surface differs widely from that of the calcareous valve just described, extending well above the umbo, having three points or angles, one between carina and upper *latus*, one between

upper and inframedian latera, and one meeting the carinal angle of the inframedian latus; to each of these points a strong curved ridge runs from the umbo.

*Peduncle* about as long as or shorter than capitulum, with large transverse plates, not overlapping, widely spaced in holotype, more closely set in paratype, in five longitudinal rows of 11 to 15 plates.

*Mandible* (fig. 6, C) with four teeth, the middle interspace the shortest. *Maxillula* (fig. 6, D) with oral edge sinuous, with a large spine at its proximal third and another at its

Fig. 7.

*Scalpellum juddi*, holotype.

A. Segment of exopod of sixth cirrus. B. First cirrus (setæ omitted).

distal end. *Cirri* pale purplish. *First cirrus* (fig. 7, B) with exopod much expanded, of 12 segments, endopod of 16. *Sixth cirrus* with about 38 segments in exopod, five pairs of long spines with shorter setæ between on middle segments (fig. 7, A). *Caudal appendages* (fig. 6, A, B) equal to peduncle of sixth cirrus, of six segments (holotype), or a little longer than peduncle, of eight segments (paratype). *Penis* absent.

*Male*. In the paratype about fifteen males and larvæ were attached inside the margin of the scutum on one side and three or four on the other. The males are saccular or flask-shaped, with a very short neck, and the outer surface is

spinose. Four very small calcified valves are clearly visible in some specimens, but in others no trace of these is to be detected.

*Measurements.*—*Female* (holotype). Length of capitulum 43 mm., breadth 36 mm., thickness 19 mm.; length of peduncle 48 mm., diameter 21 mm.

*Male.* About  $0.8 \times 0.45$  mm.

*Remarks.*—A group of species within the section *Arco-scalpellum* of Hoek is characterized by the great thickness of the cartilaginous substance of the capitulum, so that the calcareous valves are entirely or all but entirely concealed. The group includes, in Oriental seas, *S. alcockianum* and *S. persona*, Annandale, from both of which the species now described is separated by the brevity of the caudal appendages and by various small characters of the calcareous valves, the non-excavated margins of the terga being perhaps the most important. In the Atlantic the most closely related species is *S. giganteum*, Gruvel, which is distinguished by various details of the capitular valves and by the truncate, almost clavate, form of the short caudal appendages. From all these species that now described appears to differ further in the flattened parietes of the carina and in having no penis. This last character is probably of great importance as a specific distinction, although Pilsbry has stated that in *S. regium* the penis may be present or absent (Bull. U.S. Nat. Mus. lx. 1907, p. 28), or, in other words, the large individuals of the species may be either hermaphrodite or purely female\*.

The specific name is chosen in recognition of the part taken by Mr. Walter Judd in obtaining for the Museum the very interesting collection now described.

*Scalpellum (Scalpellum) persona*, Annandale.

*Scalpellum persona*, Annandale, Jour. Straits Branch. Roy. Asiatic Soc. No. 74, 1916, p. 295, pl. iv. fig. 3, pl. v. figs. 7, 8, pl. vi. figs. 3-5.

*Locality.*—Lat.  $8^{\circ} 46'$  S., long.  $114^{\circ} 44'$  E. (Java-Australia), 400 fath. C./S. 'Recorder.' 8 ♂.

*Remarks.*—The specimens agree well with the descriptions

\* Pilsbry implies that only one specimen of *S. regium* was examined by Hoek as to this character. There were at least six syntypes, but only two now survive, and one of these is imperfect; the other has no penis. On the other hand, the holotype of *S. regium*, var. *ovale* (which, from other characters, may possibly deserve specific rank), has a penis.

and figures of Annandale, but the largest is only about two-thirds of the size shown by his figure (no measurements are recorded in the text). Further, the surface of the capitulum, instead of being glabrous, is covered with a very short and fine velvety pubescence with longer hairs scattered at intervals. The largest specimen shows an inflation of the capitulum like that described above in *S. alcockianum*. The angular projection of the peduncular scales is very prominent and characteristic.

The cirri are light-coloured. The caudal appendages are about twice as long as the peduncle of the sixth cirrus and have 13 to 16 segments. No males were found.

*Scalpellum (Scalpellum) portoricanum*, Pilsbry.

*Scalpellum portoricanum*, Pilsbry, Bull. U.S. Nat. Mus. lx. 1907, p. 35, text-fig. 8.

*Locality*.—Lat. 18° 31' N., long. 66° 19' W. (Off Porto Rico), 180 fath. C./S. 'Henry Holmes.' 2 ♀.

*Remarks*.—The two specimens differ from the description of the typical *S. portoricanum* in having the cuticle covered with a close but very short velvety pile (the subspecies *intonsum* is said to be "rather densely hairy"). The valves are all in contact, as in the figure of the subspecies. The marginal ridges of the carina are obsolescent and the area between them slightly convex; the base of the carina is angled. The carinal latera do not spread outwards quite so much as in the figures. The rostral latus approaches closely the proportions of that figured for the typical form. The inframedian latus is wider at the base than it is high, but shows the characteristic curvature of the apex towards the scutum. The peduncle is as long as the capitulum. The peduncular plates of the larger specimen are more transversely elongated than in the figure of the type and not close-set and overlapping as in that of the subspecies. There are seven longitudinal rows of about eleven plates in the larger specimen. The capitular valves show traces of a reddish colouring arranged in bands following the lines of growth.

Although the larger of our two specimens is more than twice the size of the holotype, the agreement in all characters except those mentioned above appears close enough to warrant its identification with this species.

No account of the appendages is given by Pilsbry. The

following particulars are taken from the larger of our specimens. *Mandible* with four teeth, the interval between the two distal not quite twice that between first and second. *First cirrus* with exopod considerably expanded, segments 12 and 15. *Sixth cirrus* with about 35 segments in exopod, five pairs of spines on middle segments with shorter setae between, no conspicuous setae on inner face of endopod. *Caudal appendages* as long as peduncle of sixth cirrus, slender, with a stouter base, consisting of about 7 segments. *Penis* stout, tapering to an acute tip, at least half as long as sixth cirrus.

This species is evidently closely allied to the Malayan *S. sociabile*, Annandale, a species which, like that of Pilsbry, includes named varieties. As regards the capitular valves, the differences between West Indian and Malayan specimens are not great, the relatively longer carina extending beyond the distal third of the tengu in the present species, and the more complete disappearance of the marginal ridges of that valve in *S. sociabile* being perhaps the most important. The scuto-tergal angle of the upper latus is more acute in *S. sociabile*. The caudal appendages, however, differ considerably. In *S. sociabile* the basal segment is greatly expanded, and exceeds the length of the distal segments together. In *S. portoricanum* the basal segment is little expanded and not more than half as long as the distal portion.

If our specimens are correctly identified with Pilsbry's species their occurrence so near the type-locality is suggestive of a very restricted area of distribution.

*Scalpellum (Scalpellum) rubrum*, Hoek.

*Scalpellum rubrum*, Hoek, Rep. 'Challenger' Cirripedia, 1883, p. 91, pl. iv. fig. 18; Pilsbry, Bull. Bur. Fish. Washington, xxix. 1911, p. 62, pl. viii. figs. 1-4, text-fig. 1.

*Locality*.—Lat. 7° 35' S., long. 114° 30' 30'' E. (Java Sea), 73-175 fath. C./S. 'Recorder.' 1 ♂.

*Remarks*.—The holotype in the 'Challenger' collection is very minute (length of capitulum 5 mm.), but Pilsbry has described and figured specimens of 17 mm. capitular length. The specimen in the present collection is nearly twice as large (capit. length 32 mm.) as those described by Pilsbry, but is without doubt referable to the same species. It shows no trace of red coloration except on the upper part of the roof of the carina. The tergum is more than twice



as long as wide and its ocludent margin is nearly straight. The rostral latus is a good deal lower than in Pilsbry's figure and the inframedian latus is twice as broad at the base as it is high. The fifth cirri have about 25 segments, the median ones with four to five pairs of large and one pair of smaller spines anteriorly, and five to seven setae on inner face of middle segments of endopod. The caudal appendages are very slender and have about 20 segments. The penis is about half as long as the sixth pair of cirri, stout, tapering, and pilose except near the tip. Pilsbry describes it as "extremely long and slender, with some short, very sparsely scattered, hairs." In other respects the specimen agrees very well with Pilsbry's account. The minute holotype, which is now somewhat imperfect, agrees generally with Pilsbry's figure, although with slight differences in the proportions of the plates, no doubt correlated with the great difference in size. The caudal appendages have about 6 or 7 segments and do not exceed the peduncle of the sixth cirri in length. One characteristic feature shown by the holotype, by Pilsbry's figure, and very conspicuously by the present specimen, is the prominence of the carinal row of peduncular plates which project as a series of teeth, bluntly angular and slightly curved downwards.

*Scalpellum (Scalpellum) novæ-zelandiæ*, Hoek.

*Scalpellum novæ-zelandiæ*, Hoek, Rep. 'Challenger' Cirripedia, 1883, p. 124, pl. v. figs. 7, 8; Gruvel, Exp. 'Travailleur' et 'Talisman,' Cirrhipèdes, 1902, p. 54, pl. ii. figs. 12, 13, 15; Annandale, Illustr. Zool. 'Investigator' Crust. Entom. pl. v. fig. 7 (1908); id. Rec. Ind. Mus. ix. 1913, p. 231.

*Locality*.—Lat.  $14^{\circ} 20' N.$ , long.  $52^{\circ} 30' E.$  (Gulf of Aden), 1200 fath. C./S. 'Electra.' 2 ♀.

*Remarks*.—Our specimens were identified by Dr. Annandale and I leave them under the name which he gave them. It is to be noted, however, that the larger of the two (capitular length 17 mm.) has the roof of the carina distinctly convex and the apex extending further towards the tip of the tergum than it does in the holotype. Both features tend to assimilate the specimen to the closely allied *S. flavum*, Hoek. The other specimen differs still more from the holotype, but as it is much damaged it seems unnecessary to discuss its characters at length.

*Scalpellum (Scalpellum) gruelii*, Annandale.

*Scalpellum gruelii*, and var. *quadratum*, Annandale, Ann. & Mag. Nat. Hist. (7) xvii. 1906, p. 390; id. Herdman's Rep. Ceylon Pearl Oyster Fisheries, Roy. Soc. v. 1906, p. 141, text-fig. 4; id. Illustr. Zool. 'Investigator,' Crust. Entom. pl. i. fig. 1, pl. ii. figs. 1, 1 a, 3 (1907); id. Rec. Ind. Mus. ix. 1913, p. 232.

*Scalpellum chitinosum*, Hoek, 'Siboga' Exp., Cirripedia Pedunculata, 1907, p. 73, pl. vii. fig. 4.

*Localities*.—Lat. 12° N., long. 46° E. (Gulf of Aden), 770 fath. C./S. 'Colonia.' 1 ♀.

Lat. 14° 20' N., long. 52° 30' E. (Gulf of Aden), 1200 fath. C./S. 'Electra.' 1 ♀. (Annandale det.)

*Remarks*.—In view of the variability which Annandale attributes to this species, and of the fact that one of the specimens was determined by him, they may both be recorded under this name, although I am not altogether satisfied as to the characters that are said to distinguish the species from some others, such as *S. curiosum*, Hoek. In the characters of the cirri and of the mandible one of our specimens agrees well with the figures given by Pilsbry (Bull. U.S. Nat. Mus. lx. 1907, p. 75) for his *S. imperfectum*, which Annandale suggests as a possible synonym for this species.

*Scalpellum (Scalpellum) laccadivicum*, Annandale.

*Scalpellum laccadivicum* and var. *investigatoris*, Annandale, Ann. & Mag. Nat. Hist. (7) xvii. 1906, p. 393; id. Illustr. Zool. 'Investigator,' Crust. Entom. pl. i. figs. 3, 4 (1907); id. Rec. Ind. Mus. ix. 1913, p. 235.

*Scalpellum subflavum*, id. Ann. & Mag. Nat. Hist. (7) xvii. 1906, p. 397; id. Illustr. Zool. 'Investigator,' Crust. Entom. pl. i. fig. 6 (1907).

*Scalpellum polymorphum*, Hoek, 'Siboga' Exp., Cirripedia Pedunculata, 1907, p. 80, pl. vii. figs. 9-11.

*Locality*.—Lat. 8° 46' S., long. 114° 44' E. (Java-Australia), 400 fath. C./S. 'Recorder.' 1 ♀.

*Remarks*.—The synonymy given by Annandale and reproduced above implies a range of variation that may well include our single specimen which approaches Annandale's *S. subflavum*. It seems also possible that *S. longius* and *S. lambda*, Annandale, concerning the specific distinctness of which from one another Annandale expresses himself as doubtful, might also be included within the limits of the same specific name.

XV.—*Descriptions of New Pyralidæ of the Subfamily Pyraustinæ.* By Sir GEORGE F. HAMPSON, Bart., F.Z.S., &c.

[Continued from ser. 8, vol. xx. p. 384.]

(27 a) *Pilocrocis metachrysiæ*, sp. n.

♂. Head and thorax black-brown glossed with silvery blue; abdomen orange-yellow, the anal tuft black-brown at extremity with a leaden gloss; pectus, legs, and ventral surface of abdomen orange-yellow, the fore tarsi black at extremities, the mid and hind tarsi with black streaks below towards extremities. Fore wing black-brown glossed with silvery blue to beyond end of cell and on inner area to middle, the rest of wing glossed with purple. Hind wing orange-yellow, the terminal area black-brown glossed with purple, broadly at costa and narrowing to a point at termen at vein 2; the underside with the costa purplish black-brown to towards base.

*Hab.* PERU, Yahuar Mayo, 1 ♂ type. *Exp.* 38 mm.

(31 a) *Pilocrocis cupreinitens*, sp. n.

♀. Head and thorax dark brown with a bronze gloss; abdomen black-brown with whitish bands on basal segments, then with some white irroration; antennæ black-brown; pectus and ventral surface of abdomen ochreous white; legs cupreous brown, the tarsi banded blackish and white. Fore wing dark brown glossed with brown; a small whitish spot at base of cell; a brownish white antemedial spot from below costa to median nervure defined on each side by black bars, then an oblique black line; a brownish white medial bar from below costa to median nervure defined on each side by black lines, the line on its inner side continued to submedian fold; a minute white spot in end of cell and a sinuous black line just beyond the cell from below costa to vein 4; a broad whitish band suffused with bronze-brown beyond the cell, extending to beyond the postmedial line and below the cell to the line from the medial bar; postmedial line black, excurved and waved from vein 6 to 3, then bent inwards to below angle of cell and oblique to inner margin; cilia whitish tinged with bronze-brown and with blackish line at middle. Hind wing white tinged with bronze-brown, the terminal area broadly dark brown glossed with bronze; a quadrate discoidal spot defined by black; an oblique black shade from middle of cell to inner margin; postmedial line black, slightly bent inward at vein 2, then oblique to inner margin, slightly diffused on inner side at discal fold; cilia with white line at base and black line at middle, the tips white mixed with black-brown.

*Hab.* JAMAICA (*Jackson*), 2 ♀ type. *Exp.* 36 mm.

(32 c) *Pilocrocis caustichroalis*, sp. n.

♀. Head, thorax, and abdomen yellow suffused with brick-red; antennæ tinged with brown except at base; palpi with the basal joint and the 2nd joint in front towards base pure white, the rest of 2nd joint deeper red; the fore tibiae banded with white, the mid tibiae white below, the fore and mid tarsi white; ventral surface of abdomen whitish tinged with rufous. Fore wing yellowish suffused with brick-red; antemedial line red-brown, erect to median nervure, then oblique to above vein 1 and again erect to inner margin; a minute red-brown spot in upper part of middle of cell and discoidal bar; postmedial line red-brown, erect to vein 5, then minutely waved to above vein 2, then retracted to lower angle of cell and excurved above inner margin; cilia with brownish line at middle and whitish tips. Hind wing yellowish suffused with brick-red, the costal area white to beyond middle: an oblique red-brown discoidal bar; postmedial line red-brown, erect to discal fold, then oblique and slightly waved to above vein 2, then retracted and almost obsolete to lower angle of cell and oblique to inner margin; a faint punctiform brownish terminal line; cilia with brownish line at middle and whitish tips.

*Hab.* PERU, Yahuar Mayo (*Watkins*), 1 ♀ type. *Exp.* 30 mm.

(35 a) *Piletocera nigridentalis*, sp. n.

Head, thorax, and abdomen pale yellow, the head with small black spot between antennæ, the patagia with black spot at middle, the abdomen with a few black scales and subdorsal spots on 3rd and 5th segments; palpi with the 3rd joint black; fore femora suffused with black above, the tibiae with black band at extremity. Fore wing pale yellow, the terminal area slightly tinged with rufous; a black spot at base; antemedial line black, dilated into a small spot below costa, oblique to submedian fold and with some black scales before it on inner margin; a black spot in middle of cell and elliptical discoidal spot; postmedial line black, dilated towards costa, rather oblique to vein 4, then inwardly oblique, dentate, angled inwards at vein 2 and forming a spot at inner margin. Hind wing pale yellow, the terminal area tinged with rufous; a black discoidal spot; postmedial line black, arising at vein 6, very oblique to vein 4, then highly dentate, a broad blackish shade beyond it.

*Hab.* BR. C. AFRICA, Ruu Valley (*Neave*), 1 ♂ type, Mt. Mlanje (*Neave*), 2 ♀. *Exp.*, ♂ 22, ♀ 26 mm.

(1 c) *Ulopeza disjunctalis*, sp. n.

♂. Head orange-yellow; tegulae and prothorax yellowish suffused with red-brown, the rest of thorax and abdomen dark brown with a leaden grey gloss; antennæ black; pectus, legs, and ventral surface

of abdomen except at extremity yellowish white, the coxæ and femora and tibiæ at extremities black, the genital tufts yellow tinged with rufous. Fore wing dark brown with a strong cupreous gloss, the basal area and the costa to beyond middle glossed with purple; an orange-yellow spot on costa above end of cell nearly touching a rather oblique elliptical yellowish white discoidal spot. Hind wing dark brown with a cupreous gloss; a fine whitish line at base of cilia.

Ab. 1. Fore wing without the yellow spot above end of cell.

Hab. CAMEROONS, Ja R., Bitje (*Bates*), 3 ♂ type. Exp. 30 mm.

(3a) *Chalcidoptera orbiscalis*, sp. n.

Antennæ of male thickened by a ridge of scales near base; hind tibiæ short with a large tuft of hair above at extremity.

♂. Head and thorax yellowish white suffused with rufous; abdomen pale grey-brown; antennæ whitish, blackish towards base; pectus, legs, and ventral surface of abdomen white tinged with rufous, the fore coxæ with black patches, the fore tibiæ with black band at extremity, the mid femora at extremity and tibiæ below blackish, the tufts of hair on hind tibiæ black. Fore wing pale red-brown, the terminal area grey-brown; the medial part of costal area yellow, conjoined to an oblique elliptical white spot in end of cell; a round white postmedial patch between veins 7 and 4; a yellow fascia on costal area towards apex conjoined to a yellowish white subterminal spot below vein 8, followed by three small white spots edged with yellow between veins 7 and 4; cilia glossy dark brown. Hind wing uniform brown with a silvery gloss; the underside brownish white with a curved brown postmedial line from costa to vein 5 and dark terminal band to below vein 3.

Hab. CAMEROONS, Ja R., Bitje (*Bates*), 6 ♂ type. Exp. 26-30 mm.

(8) *Filodes tenuimarginalis*, sp. n.

♀. Head brown; thorax and abdomen pale orange-yellow; antennæ yellowish tinged with brown towards tips. Fore wing pale orange-yellow, the costa tinged with brown; the terminal area tinged with brown narrowing to a point at vein 2; cilia dark brown with a silvery gloss. Hind wing pale orange-yellow, the termen narrowly and cilia dark brown with a silvery gloss.

Hab. CELEBES, Saugir I. (*Doherty*), 1 ♀ type. Exp. 46 mm.

(3a) *Dichogama diffusalis*, sp. n.

♂. Head and thorax greyish white; abdomen white slightly tinged with brown; antennæ tinged with red-brown; pectus, legs, and ventral surface of abdomen silvery white, the fore tarsi brown

at extremities. Fore wing silvery grey-white faintly irrorated with reddish brown scales; a broad antemedial dark shade formed by black-brown scales; a diffused triangular dark patch from costa to lower angle of cell formed by black-brown scales and a diffused patch at middle of inner margin; postmedial line blackish, oblique to discal fold, then obliquely excurved to submedian fold below end of cell and oblique to inner margin; the termen tinged with brown towards apex and with terminal series of black points to vein 3; cilia tinged with brown. Hind wing semihyaline silvery white; a terminal series of black points from apex to above vein 3.

*Hab.* VENEZUELA, Esteban Valley, Las Quignas, 1 ♂ type.  
*Exp.* 40 mm.

Genus *PHRYGANODES* will stand as

	<b>Type.</b>
<i>Phostria</i> , Hübn. Verz. p. 130 (1827).....	<i>temira</i> .

(16 c) *Phostria xanthoproctalis*, sp. n.

♂. Head fulvous yellow; thorax and basal half of abdomen glossy grey-brown, the former with a faint purple gloss, the latter with the terminal half fulvous yellow; antennæ brown; fore legs yellow, the coxæ grey-brown except on outer side, the femora and tibiæ black at extremities, the mid and hind tarsi yellowish; ventral surface of abdomen fulvous yellow. Fore wing uniform glossy grey-brown tinged with purple. Hind wing glossy grey-brown tinged with purple, the inner area slightly paler.

*Hab.* VENEZUELA, Esteban Valley, Las Quignas, 1 ♂ type.  
*Exp.* 46 mm.

(22 a) *Phostria purpureonitens*, sp. n.

♂. Head, thorax, and abdomen grey-brown glossed with purple, the anal tuft greyer; antennæ dark brown; basal joint of palpi and throat pure white; pectus and legs white suffused in parts with grey-brown; ventral surface of abdomen silvery grey-brown. Fore wing grey-brown glossed with brilliant purple except on basal and costal areas; cilia darker brown. Hind wing grey-brown glossed with brilliant purple except at base and on inner area; cilia darker brown.

♀. Hind wing with small round white discoidal spot.

*Hab.* D'ENTRECASTEAUX Is., Woodlark I. (*Meek*), 1 ♂, 1 ♀ type. *Exp.* 40 mm.

(30 b) *Phostria flaviceps*, sp. n.

♀. Head and tegulae pale orange-yellow, the frons whitish tinged with yellow; thorax and abdomen pale grey-brown; antennæ pale grey-brown; palpi yellow, white at base; pectus, legs,

and ventral surface of abdomen white faintly tinged with red-brown. Fore wing pale smoky brown, the costa white to near apex, the cilia whitish tinged with brown. Hind wing pale smoky brown, the cilia whitish tinged with brown. Underside silvery white tinged with brown.

*Hab.* PERU, Yahuarmayo (*Watkins*), 1 ♀ type. *Exp.* 34 mm.

(48 a) *Phostria aterrimalis*, sp. n.

Abdomen of male with subdorsal tufts of hair on anal segment.

Head, thorax, and abdomen very dark black-brown; palpi with the 1st joint and the 2nd in front to middle whitish; pectus, legs, and ventral surface of abdomen white with a faint ochreous tinge, the fore tibiæ with a black band near extremity. Fore wing very dark black-brown; the cilia with a fine pale line at base and the tips white towards tornus. Hind wing very dark black-brown; the cilia with a fine pale line at base; the underside with the inner area whitish.

*Hab.* CAMEROONS, Ja R., Bitje (*Bates*), 1 ♂ type. *Exp.* 24 mm.

(54 a) *Phostria chrysomera*, sp. n.

♂. Head golden yellow; thorax and abdomen dark brown with a purple gloss, the tegulae at base and on outer edge, the patagia except a patch at base of outer edge and subdorsal stripes on abdomen golden yellow; antennæ glossy black-brown; frons with cupreous brown patch below; palpi yellow with brown band near extremity of 2nd joint; pectus and ventral surface of abdomen pale yellow; legs grey-brown. Fore wing dark brown glossed with brilliant purple; a wedge-shaped golden yellow patch in the cell from base to near extremity; a broad oblique golden yellow post-medial band from just below costa to submedian fold near termen, its lower edge obliquely curved; a golden yellow streak on inner margin from base to beyond middle. Hind wing golden yellow, the inner area from near base and the terminal area dark brown glossed with brilliant purple, the extremity of the yellow area rounded so that the dark area expands widely towards costa and tornus.

*Hab.* PERU, Yahuarmayo, 1 ♂ type. *Exp.* 40 mm.

(55 a) *Phostria disciridescens*, sp. n.

♂. Head and base of tegulae fulvous orange; antennæ black-brown; thorax and abdomen dark brown tinged with grey, the anal tufts of male orange at sides and the genital tufts whitish; palpi, pectus, legs, and ventral surface of abdomen fulvous orange, the fore tibiæ with brown patch near extremity and the tarsi ringed

with brown. Fore wing dark brown tinged with grey; some bluish grey hair at base except at costa; the interspaces of medial area from below costa to submedian fold white glossed with iridescent blue. Hind wing semihyaline white, the inner area broadly and the terminal area dark brown with a slight greyish tinge.

*Hab.* PERU, Chaguinayo (*Watkins*), 4 ♂ type. *Exp.* 40 mm.

(64*b*) *Phostria albescentalis*, sp. n.

Head, thorax, and abdomen whitish suffused with pale brown, the last with white segmental rings; antennae pale brown, the basal joint whitish; palpi pale brown, white towards base; pectus, legs, and ventral surface of abdomen white, the legs tinged with brown, the fore tibiae with brown band near extremity. Fore wing whitish suffused with pale grey-brown; some white at base of inner margin with a small black spot at its extremity; a curved blackish antemedial line; a small black spot in middle of cell and elliptical discoidal spot; postmedial line blackish, rather oblique to vein 5, then dentate to below vein 3, then retracted to below angle of cell and somewhat excurved at submedian fold; a slight blackish terminal line and fine whitish line at base of cilia. Hind wing with the basal half white, the terminal half whitish suffused with pale grey-brown; a small oblique black discoidal spot; a diffused dark postmedial line, its outer edge bent outwards and slightly waved between veins 5 and 2; an indistinct diffused curved brown subterminal line; a black terminal line and fine whitish line at base of cilia. Underside white, the terminal area of fore wing suffused with brown; both wings with prominent black discoidal spots.

*Hab.* PORTUGUESE E. AFRICA, Kola Valley (*Neave*), 1 ♂, 1 ♀, Mt. Chipirone (*Neave*), 1 ♂, 2 ♀ type. *Exp.* 32-36 mm.

(55*f*) *Phostria euryleucalis*, sp. n.

♂. Head, thorax, and abdomen dark brown with a cupreous gloss; frons with white lines at sides; pectus and ventral surface of abdomen white; femora striped with white; tarsi white tinged with brown. Fore wing dark brown with a cupreous gloss; hyaline stripes in and below the cell and a spot above base of vein 2, slightly irrorated with brown; a broad oblique white band from below costa beyond middle to above tornus, its lower extremity rounded. Hind wing hyaline, the veins streaked with dark brown; a rather narrow dark brown terminal band with a cupreous gloss, narrowing to a point at tornus, the hyaline area towards it slightly irrorated with brown and with slight brown streaks in the interspaces.

*Hab.* PERU, Yahuarmayo (*Watkins*), 2 ♂ type. *Exp.* 42 mm. Closely allied to *P. calydon*, Druce.



(55 g) *Phostria internervalis*, sp. n.

♂. Head, tegulae, and patagia dark brown, the outer edge of tegula and base of patagia deep orange, the dorsum of thorax white with dark brown dorsal streak; abdomen white with dark brown segmental lines, dorsal streak and lateral fasciæ; lower part of frons white; palpi white in front at base; pectus and ventral surface of abdomen white; legs dark brown, the femora and tibiæ white below. Fore wing dark brown tinged with purple; a slight white streak below basal half of costa; a wedge-shaped white patch in end of cell; a broad white fascia in submedian fold from near base to near termen with the submedian fold slightly streaked with brown; broad white fasciæ in the interspaces above veins 2, 4, 5, and 6 to near termen leaving dark streaks on the veins and a patch beyond the cell; a short white streak above middle of vein 7 and a white streak above vein 3 towards termen. Hind wing white; the veins arising from median nervure, vein 1 and the terminal part of submedian fold and vein 6 streaked with dark brown tinged with purple; the costa towards apex and termen rather narrowly dark brown tinged with purple.

*Hab.* COLOMBIA, Choko, Juntas de R. Tamana and R. San Juan (*Palmer*), 1 ♀ type. *Exp.* 44 mm.

(64 e) *Phostria aræosoma*, sp. n.

♂. Head, thorax, and abdomen glossy grey-brown, the last long and slender; palpi white in front except towards extremity; pectus, legs, and ventral surface of abdomen white tinged with brown, the fore tibiæ with dark band near extremity. Fore wing glossy grey-brown tinged with purple, the costal half of basal area rather darker; an indistinct dark antemedial line; rather ill-defined blackish spots at middle and end of cell with paler patches beyond them; an indistinct diffused brown postmedial line defined on outer side by diffused whitish, excurved between veins 5 and 2, then retracted to below end of cell; cilia with a fine white line at base. Hind wing glossy grey-brown tinged with purple, the basal and inner areas paler and thinly scaled; an oblique blackish discoidal bar; an indistinct rather diffused brown postmedial line defined on outer side by whitish, somewhat bent outwards between veins 5 and 2, then retracted to below end of cell and excurved to inner margin; cilia with a fine white line at base. Underside whitish tinged with brown, the terminal areas suffused with brown.

*Hab.* CAMEROONS, Ja R., Bitje (*Bates*), 3 ♂ type. *Exp.* 38-48 mm.

(11 a) *Dichocrocis polystilzalalis*, sp. n.

♀. Head, thorax, and abdomen yellow, the tegulae at sides, patagia at base and middle and metathorax with black spots, the

abdomen with dorsal and lateral series of black spots; maxillary palpi black at tips; (labial palpi wanting); fore coxæ with black spots. Fore wing yellow; a curved subbasal series of three black spots; an oblique antemedial series of spots to vein 1 and a spot nearer the base on inner margin; a spot in end of cell and discoidal bar; a lunulate spot below origin of vein 2 and spot on inner margin; a postmedial series of spots from costa to vein 2, the spots above and below vein 7 elongate and nearer the termen, the spot at discal fold nearer the cell, the spots between veins 5 and 2 obliquely placed with spots before them above and below vein 3; a subterminal series of spots, oblique from below costa to discal fold and again oblique from below vein 5 near termen to inner margin; cilia metallic silver at tips. Hind wing yellow; a black discoidal spot and bar in submedian interspace below end of cell; a postmedial spot at discal fold and curved series of three spots between veins 5 and 2; a subterminal series of spots between veins 7 and 1, the spot at discal fold further from termen; cilia metallic silver at tips.

*Hab.* GOLD COAST, Kumasi (*Dowall*), 1 ♀ type. *Exp.* 42 mm.

(30 a) *Dichocrocis rubritinctalis*, sp. n.

♀. Head, thorax, and base of abdomen pale yellow, the tegulæ with pale red patches, the patagia with pale red streak above and the extremity pale red, the basal segment of abdomen with pale red subdorsal spots, the rest of abdomen rufous with black subdorsal spots on anal segment; antennæ brownish except towards base; palpi blackish behind; pectus, legs, and ventral surface of abdomen pale yellow, the fore tibiæ with brown band at extremity. Fore wing pale yellow; a brown bar near base from costa to submedian fold with a pale red band beyond it extending to inner margin; a slightly curved brown and pale red antemedial line; the medial area with the cell pale red with a rather quadrate whitish spot in it defined at sides by brown, some pale red beyond lower angle of cell and some pale red in submedian interspace below middle of cell; postmedial line brown, erect to discal fold, excurved to vein 3, then retracted to lower angle of cell and rather oblique to inner margin; the terminal area broadly grey-brown suffused with pale red, its outer edge excurved at vein 6; a blackish terminal line; cilia grey-brown with a yellowish line at base. Hind wing pale yellow; an oblique blackish discoidal bar and some pale red below angle of cell; postmedial line blackish, oblique to vein 3, then obsolete and retracted to below end of cell and again oblique to inner margin; the terminal area broadly pale red, tinged with grey-brown towards costa, its inner edge incurved to the postmedial line at vein 3; a black terminal line; cilia pale grey-brown with a yellowish line at base.

*Hab.* BR. C. AFRICA, Mt. Mlanje (*Neave*), 3 ♀ type. *Exp.* 26 mm.

(35 d) *Dichocrocis biplagialis*, sp. n.

♂. Head and thorax pale red-brown; abdomen pale rufous with white segmental lines; antennæ whitish tinged with rufous; pectus, legs, and ventral surface of abdomen white. Fore wing pale red-brown; a yellowish white discoidal spot defined at sides by rather darker brown and conjoined to a yellowish white patch above it on costa; a yellowish white postmedial bar from costa to vein 6, its outer edge somewhat dentate; cilia ochreous at base followed by a pale brown line, the tips whitish tinged with red-brown. Hind wing white tinged with red-brown, the terminal area browner except towards tornus; cilia yellowish at base, with a pale brown line near base, the tips white tinged with brown.

*Hab.* GAMBIA (Sir A. Moloney), 1 ♂; N. NIGERIA, Zungeru (Macfie), 1 ♂ type. *Exp.* 24 mm.

(38) *Dichocrocis leucostolalis*, sp. n.

♂. Head and thorax white tinged with fulvous, the patagia pure white except on outer edge towards base; abdomen pure white at base and extremity, the medial segments tinged with fulvous; pectus and legs white, the femora tinged with fulvous; ventral surface of abdomen white tinged with fulvous. Fore wing silvery white, tinged with fulvous at base; a brown shade through the cell from near base to near termen towards which it expands somewhat. Hind wing silvery white, very faintly tinged with brown except on inner and terminal areas. Underside of fore wing with the costal area broadly suffused with brown.

*Hab.* PERU, Pozuzo, 1 ♂ type. *Exp.* 24 mm.

Genus *NACOLELA* will stand as

	Type.
<i>Lamprosema</i> , Hübn. Verz. p. 361 (1827) .....	<i>lunulalis</i> .

(1 a) *Lamprosema pectinalis*, sp. n.

Antennæ of male bipectinate with short branches ending in forked bristles, the apical part serrate.

♂. Head, thorax, and abdomen pale grey-brown; frons and palpi darker brown, the latter white at base; pectus, legs, and ventral surface of abdomen white faintly tinged with brown. Fore wing pale grey-brown, the basal costal area and the terminal area rather darker brown; a dark antemedial line, oblique to discal fold; a black discoidal bar; postmedial line dark defined on outer side by whitish, erect to vein 5, then excurved and slightly waved to below vein 3, then retracted to below end of cell and excurved below submedian fold; a slight dark terminal line; cilia whitish tinged with brown. Hind wing pale grey-brown, the terminal area rather darker; a black discoidal spot; postmedial line dark

slightly defined on outer side by whitish, bent outwards and waved between veins 5 and 3; a slight dark terminal line; cilia white tinged with brown.

*Hab.* C. CHINA, Hupeh, Lui-shin-tze (*Betton*), 1 ♂ type; BORNEO, Sarawak, 1 ♂. *Exp.* 18 mm.

(1 c) *Lamprosema anæmicalis*, sp. n.

Fore wing of male on upperside with a slight fringe of hair on costa above end of cell with a tuft of hair below it at upper angle of cell.

♂. Head, thorax, and abdomen pale ochreous tinged with rufous; palpi with the third joint blackish above; pectus, legs, and ventral surface of abdomen ochreous white, the fore legs suffused with fuscous in front. Fore wing ochreous white, the veins fuscous, the costal edge black towards base; a brown antemedial shade, expanding to near base at costa; the hairs on costa above end of cell and tuft of hair at upper angle of cell fuscous, a brown shade arising from them and excurved beyond end of cell; the terminal area suffused with brown; a fine black terminal cilia; cilia pale brownish with an ochreous line at base. Hind wing white with a faint ochreous tinge; a fine black terminal line.

*Hab.* PERU, Carabaya, Oconeque (*Ockenden*), 3 ♂ type. *Exp.* 20-24 mm.

(10 e) *Lamprosema leucopis*, sp. n.

♂. Head, thorax, and abdomen dark brown glossed with leaden grey and mixed with some whitish, the neck and base of tegulae pale fulvous yellow; the anal and genital tufts very large, the latter pale fulvous yellow; pectus, legs, and ventral surface of abdomen pale ochreous, the legs and basal part of abdomen suffused with brown, the fore tibiae blackish at extremity. Fore wing glossy dark brown, some whitish at base and middle of inner area; antemedial line whitish defined on outer side by black-brown, arising below the costa and slightly incurved in the cell; a small white spot in upper part of middle of cell and discoidal bar defined by black-brown; postmedial line whitish defined on inner side by diffused black-brown, waved to discal fold, then excurved to vein 2, then retracted to below end of cell and excurved below submedian fold; cilia with a punctiform white line at base. Hind wing glossy dark brown, whitish towards base; a minute blackish discoidal spot; postmedial line rather diffused whitish, slightly bent outwards and waved between veins 5 and 2, then retracted to below end of cell and excurved to inner margin; cilia with a punctiform white line at base.

*Hab.* DUTCH N. GUINEA, Snow Mts., Octakwa R. (*Meek*), 1 ♂ type. *Exp.* 28 mm.

(14a) *Lamprosema pogonotornalis*, sp. n.

Mid tibiæ of male greatly dilated; hind wing with the termen strongly excised in submedian interspace, with tufts of hair round the excision above and below.

♂. Head, thorax, and base of abdomen yellowish white mixed with fulvous, the rest of abdomen rufous with silvery white and black segmental bands; antennæ ringed with blackish; palpi with the extremity of second joint and the third joint brown, the latter white at tip; pectus, legs, and ventral surface of abdomen white faintly tinged with rufous, the fore tibiæ with blackish band at extremity, the mid tibiæ irrorated with blackish. Fore wing pale yellow suffused in parts with fulvous red especially on costal area, the terminal area broadly red-brown; a round fulvous-red spot surrounded by white above inner margin near base; an incurved black antemedial line from costa to median nervure, then a white band defined on outer side by blackish to above inner margin; a leaden grey spot defined by black except above at middle of cell, extending to just below the cell; reniform leaden grey defined by black, large and strongly constricted at middle; a white spot defined on outer side by black on costa above end of cell and white spot defined on each side by black on costa above end of cell; postmedial line with a white bar defined on each side by black at costa, then black, sinuous to vein 3, then retracted upwards to vein 5 beyond the cell, then bent inwards on median nervure to before end of cell, then oblique and sinuous with a white line on its outer side forming a spot below end of cell, some clear yellow in its sinus beyond the cell and some leaden grey confluent with the reniform in its sinus below the cell; a faint dark subterminal shade from costa to vein 3; a diffused black terminal line with series of white bars on it; cilia with black line at middle and silvery white tips. Hind wing white with some fulvous red and yellow suffusion on inner half of medial area, the terminal area broadly red-brown; a small black spot in end of cell and antemedial spot in submedian fold; postmedial line black, sinuous, at vein 2 retracted up to upper angle of cell, then rather oblique to inner margin, enclosing a leaden-grey discoidal spot; a dark subterminal shade from costa to vein 2; a narrow black terminal band from apex to vein 2 with series of white bars on it; cilia yellowish at base followed by a black line to vein 2, white at tips and towards tornus.

*Hab.* PERU, Yahuar Mayo, 1 ♂ type. *Exp.* 24 mm.

(25c) *Lamprosema aurantia*, sp. n.

♂. Head, thorax, and abdomen orange-yellow, the last irrorated with some blackish forming obscure lateral spots towards base, the genital tufts large and brownish white; palpi yellowish white, the extremity of the second joint and the third joint brown; pectus

yellowish white; fore tibiæ at extremity blackish, the tarsi whitish ringed with blackish. Fore wing orange-yellow; a blackish point on costa near base; a curved blackish shade from below costa before the antemedial line to base of inner margin, the line black and slightly sinuous; the fovea in end of cell whitish surrounded by a blackish shade extending to vein 1 beyond the antemedial line; a blackish shade beyond the cell between veins 8 and 3; postmedial line slight, blackish, excurved from vein 5 to below 3, then retracted towards lower angle of cell and ending above inner margin; an oblique blackish shade from below apex to near the postmedial line at vein 4 and a shade from the line below vein 3 to inner margin; a series of black spots before termen; cilia brown with a yellow line at base. Hind wing orange-yellow; a black bar below the cell near base; a diffused blackish spot just beyond the cell; postmedial line blackish, excurved between veins 5 and 2, then retracted to below end of cell and sinuous to inner margin where it forms a black spot; a subterminal blackish shade towards costa and shade from the postmedial line at vein 2 to vein 1; a series of small black spots before termen interrupted between veins 3 and 2; cilia brownish with a yellow line at base.

*Hab.* DUTCH N. GUINEA, Snow Mts., Oetakwa R. (*Meek*), 1 ♂ type. *Exp.* 22 mm.

(30 b) *Lamprosema bryalis*, sp. n.

♂. Head and thorax dark brown mixed with sap-green; abdomen greyish brown; antennæ dark brown; palpi grey-brown; pectus, legs, and ventral surface of abdomen whitish suffused with brown, the fore tibiæ with black band near extremity, the mid tibiæ with diffused black band near base and the terminal half black, the tuft of hair white. Fore wing sap-green irrorated with dark brown and tinged in parts with red-brown; two small black spots at base; antemedial line black defined on inner side by diffused whitish, excurved below costa, oblique and sinuous below the cell; a black spot in upper part of middle of cell and two black discoidal spots defined on outer side by a white bar; an oblique green and whitish shade from lower angle of cell to tornus; postmedial line blackish defined on outer side by green and whitish, dentate, angled inwards at vein 7, oblique from vein 3 to submedian fold, then excurved; a brown subterminal shade, expanding at costa and interrupted above tornus; a terminal series of small rather triangular brown spots; cilia chequered blackish and grey with a yellowish line at base. Hind wing dark greyish brown, the cilia rather paler with a fine yellowish line at base.

*Hab.* BR. E. AFRICA, N. Kavirondo, Maramas Distr., Ilala (*Neave*), 1 ♂ type *Exp.* 36 mm.

[To be continued.]

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# CONTENTS OF NUMBER 1.—*Ninth Series.*

	Page
I. On new African <i>Curculionide</i> .—I. By GUY A. K. MARSHALL, D.Sc. (Plate I.)	1
II. Bermudian Species of <i>Donatia</i> ( <i>Tethya</i> ). By BLANCHE BENJAMIN CROZIER	11
III. New Lepidoptera in the Joicey Collection. By L. B. PROUT, F.E.S.	18
IV. On the Striped Squirrels hitherto referred to the Genus <i>Paracerus</i> . By OLDFIELD THOMAS	33
V. Two new Tuco-tucos from Argentina. By OLDFIELD THOMAS	38
VI. <i>Protoëchinus</i> , Austin. By F. A. BATHER, D.Sc., F.R.S. (Plate II.)	40
VII. Notes on the <i>Braconide</i> in the British Museum.—II. On the Australian Species of <i>Cardiophilinae</i> and <i>Doryctinae</i> . By ROWLAND E. TURNER, F.Z.S., F.E.S.	49
VIII. Further Notes on the <i>Asilide</i> of Australia. By GERTRUDE RICARDO	57
IX. Note on the Lower Jaw of <i>Stereognathus ooliticus</i> , Charlesworth. By DR. BRANISLAV PETRONIEVICS. (Plate III.)	67
X. Variation in the Prothoracic Spines of <i>Dactylispa xanthopus</i> , Gestro. By S. MAULIK, B.A. (Cantab.), F.E.S.	70
XI. Note on <i>Epistictia reichiana</i> , Guérin. By S. MAULIK, B.A. (Cantab.), F.E.S.	74
XII. New Species and Races of <i>Ithomiinae</i> in the Joicey Collection. By W. J. KAYE, F.E.S.	77
XIII. Notes on Fossorial Hymenoptera.—XXXII. On new Species in the British Museum. By ROWLAND E. TURNER, F.Z.S., F.E.S.	86
XIV. On Barnacles of the Genus <i>Scalpellum</i> from Deep-sea Telegraph-Cables. By W. T. CALMAN, D.Sc.	96
XV. Descriptions of New <i>Pyralide</i> of the Subfamily <i>Pyraustinae</i> . By SIR GEORGE F. HAMPSON, Bart., F.Z.S., &c.	125

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THE ANNALS  
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[NINTH SERIES.]

No. 2. FEBRUARY 1918.

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XVI. — *Descriptions of Thirty-four Species of Marine Mollusca from the Persian Gulf, Gulf of Oman, and Arabian Sea, collected by Mr. F. W. Townsend.* By JAMES COSMO MELVILL, M.A., D.Sc.

[Plates IV. & V.]

THE last general descriptive paper, based upon Mr. Townsend's large collections, was published in October 1912 \*, and since then I have only essayed a revision of the Turridæ (Pleurotomidæ) † as well as the Terebridæ ‡ of the Persian Gulf region, the long continuance of the world-war having naturally prevented much apportionment of time to this task.

But now, with the following thirty-four additions to the fauna, one feels the work is almost completed. The total number enumerated cannot be very far short of two thousand, and this includes, roundly speaking, six hundred new to science. Should circumstances permit, it would be ultimately desirable to give a brief, up-to-date catalogue of the whole series, with "addenda, emendanda, and corrigenda." Doubtless several omissions have occurred, some due to inadvertence, others through paucity of material or poor condition of specimens.

\* Proc. Malac. Soc. Lond. vol. x. 1912, p. 240 *sqq.*

† *Ibid.* vol. xii. 1917, pp. 140-201.

‡ Journ. of Conch. vol. xv. 1917, pp. 188 & 204.

In the following pages I am much indebted to Mr. J. R. le Brockton Tomlin for valuable opinions and assistance; likewise to Messrs. G. B. Sowerby, Hugh Fulton, and R. Sanden. To Mr. Bernard Lucas also I am considerably under obligation for having sorted much shell-sand for me, more particularly from the very prolific sounding made in the Gulf of Oman at 156 fathoms, so often referred to in these papers; and, finally, I must congratulate Miss Gertrude Woodward on the two successful Plates accompanying these descriptions.

*Bursa gnorima* \*, sp. n. (Pl. IV. fig. 1.)

*B. testa* ovato-fusiformi, spira abbreviata, apice obtuso, varicibus rotundatis; anfractibus ad 7, quorum tres apicales, læves, globulares, cæteris suturaliter impressis, supra medium angulosis, undique arcte et delioate spiraliter granulosi, linea transversali subgranata alternante, granulis nitidis, supra medium, ad angulum, multum fortioribus; superficie pallide straminea; apertura ovata, alba; peristomate incrassato, albo, nitido, simul ac columella, intus multilirata; canali paullum recurvo, brevi.

Long. 43, lat. 27 mm.

*Hab.* Jask, Gulf of Oman.

It is with some diffidence that I have ventured to introduce another species into a well worked-out and circumscribed genus; but this shell, of which I have seen a few specimens in no way differing from each other, possesses distinctive attributes, the nearest ally seeming to be the West-American *B. crassa*, Desh., and I consider it closely comparable with no Eastern species. It is pale straw-coloured, neatly formed and compact, varices somewhat rounded; upper whorls attenuate, body-whorl uniformly finely granose, spirally, with interstitial liræ, partly granulose likewise; above the centre of the whorl a single spiral line of much larger tubercles surrounds it, and just below the sutures short longitudinal plaits extend some way towards this line; the labrum is shining white, columella lirate, also white; mouth ovate, canal short, very slightly curved. At first considered a small variety of *B. subgranosa* (Sowb.), I am obliged to Mr. Hugh Fulton for having directed my attention to this species and giving me his opinion thereupon.

\* γνώριμος, distinguished.

*Alectryon (Phrontis) alcimus*\*, sp. n. (Pl. IV. fig. 2.)

*A. testa* ovato-fusiformi, solida, alba, brunneo-lineata et hic illic variegata; anfractibus 8, quorum tres minuti, apicales, vitrei, læves, cæteris ad suturas gradatulis, longitudinaliter crassicostratis, et spiraliter sulcatis, sulcis anfractum apud ultimum circa 12, costis infra, juxta suturas, nodulosis, spiraliter brunneozonatis, et maculato-lineatis; apertura ovata, labro incrassato, albo, lævi, paullum effuso, intus multilirato; columella callosa, alba, nitida, excavata.

Long. 15, lat. 8 mm.

*Hab.* Mekran Coast.

This very select species may be a local variety of *Nassa nodicostata*, H. Adams, but differs from specimens in my collection so named by Mr. F. P. Marrat. It evidently comes nearest this species, but appears smoother than the Philippine Island type collected by Mr. H. Cuming and figured by Reeve. There has been some confusion between this shell and the similarly named *Nassa nodicincta*, Adams. This is an entirely different species, of the Western Hemisphere, though equally nodose below the sutures of the various whorls. I have it from the Galapagos Isles.

*Alectryon (Hima) gwatkinianus*, sp. n.  
(Pl. IV. fig. 4.)

*A. testa* ovata, cinerea, circa aperturam brunneo-tincta; anfractibus 8, quorum 3 apicales subhyalini, fusci, cæteris apud suturas impressis, ventricosulis, spiraliter arete noduloso-liratis, et longitudinaliter decussato-costulatis, costulis obliquis, interstitiis planatis, quadratis; apertura fere rotunda, labro effuso, intus multilirato, columella multum excavata, versus basin truncatula, canali lato brevissimo.

Long. 20, lat. 11 mm.

*Hab.* Persian Gulf.

This interesting "*Nassa*" is the Eastern analogue of the Californian *perpinguis*, Hinds, which in most ways it very closely resembles. It is, however, of slightly thicker substance and the columella more strongly excavate. A chestnut spiral band, ornamenting the whorls, likewise exists in the American species, but is absent in ours. Having received this shell from the late Rev. Professor Henry Melvill Gwatkin, as received by him direct from Mr. Townsend, I have pleasure in connecting with it the name of a friend of long standing, and

\* ἀλκιμος, stoutly-fashioned, strong.

one distinguished in many realms of thought and learning, whose relaxation it was to turn from the study of the Early Christian Fathers and deep Biblical lore\*, to such successful research in Molluscan radulæ that his name soon became a household word for accurate and discerning knowledge in this branch of the science, his loss being generally felt to be quite irreparable. After a short illness, he passed away at his Cambridge residence in November 1916, aged 73.

*Alectryon* † (*Hima*) *protrusidens*, sp. n.  
(Pl. IV. fig. 3.)

*A.* testa ovato-fusiformi, solida, albo-ochracea; anfractibus 8, quorum 3 apicales, duo superni minuti, tertius vitreus, globulosus, lævis, cæteris nequaquam suturaliter impressis, undique arctissime longitudinaliter noduloso-costulatis, et spiraliter sulcatis, nodulis apud suturas majoribus, conspicuis, ochraceo-tinctis, superficie ad medium pallidiores; apertura parva, ovata, labro, simul ac columella, paullum incrassatis, labro intus 5 denticulo-lirato, quorum denticulus secundus et quintus majores, protrudentes, margine columellari versus basin obscure bilirato, excavato.  
Long. 12, lat. 5 mm.

*Hab.* Karachi.

This small species, compact, solid, hardly suturally impressed, ochreous-banded spirally below, longitudinally closely nodoso-costulate, and transversely closely decussato-sulcate, possesses a distinction in the protrusive character of two of the five lirate denticulations of the inner side of the lip.

*Pisania townsendi*, sp. n. (Pl. IV. fig. 5.)

*P.* testa attenuato-fusiformi, gracili, uniformiter straminea; anfractibus 8, quorum duo vitrei, læves, cæteris suturaliter multum impressis, ventricosis, centraliter paullum angulosis, longitudinaliter obtusi-costatis; anfractus ultimi numero 12, undique pulcherrime spiraliter liratis, circa 24-25; apertura oblonga, angusta, labro recto, intus multilirato, columella recta, canali lato, paullulum recurvo.  
Long. 22, lat. 8 mm.

*Hab.* Karachi.

\* Professor Gwatkin was long "Dixie Professor of Ecclesiastical History" at Cambridge University. In 1867 he passed first class in the Mathematical, Classical, and Theological Tripos, as also in that of Moral Science—an almost unique record.

† We spell the Montfortian name, presumably derived from ἀλεκτρυών, a cock, with a "y" in preference to i, to conform to the rule of nomenclature which holds that the Greek "upsilon" equals the Latin "y."

A little like *P. crocata*, Reeve, in form, but in this species the whorls are far more angular and echinate. From *P. gaskelli*\*, Melv. (= *neglecta*, Sowb.), it differs in much finer and more frequent spiral liration, the interstices in both species being spirally striate but much finer in character, and as 4 to 2 in *townsendi* compared with *gaskelli*. General form identical.

We dedicate this most interesting species to its discoverer, and I am indebted to Mr. G. B. Sowerby for calling my attention to it and confirming my view that it needed description.

*Mitra vaticinator* †, sp. n. (Pl. IV. fig. 6.)

*M. testa* oblongo-fusiformi, solidula, straminea, infra suturas et centraliter floccis albis variegata; anfractibus ad 8, subgradatis, suturaliter vix impressis, undique arcuissime regulariter sulcis spiralibus præditis, longitudinaliter decussato-cancellatis, ultimo anfractu cæteris magnopere exæquante; apertura angusta, oblonga, labro paullum effuso, columella quadriplicata, subobliqua. Long. 26, lat. 10 mm.

*Hab.* Persian Gulf, off Muscat, Arabia.

I have, in company with the late Mr. Edgar Smith, compared this species with its near allies, when we considered that it differed from all others. In size it comes nearest to *M. guttata*, Sw., and in general appearance is similar to that species, but the decussate cancellation is here much finer and more regular. Likewise, in *guttata* the spiral lines are somewhat distant. In *M. solida*, Reeve, found in the region we are treating of by Mr. Townsend, the whorls are more tumid and the sutures deep. In the larger and coarser *M. ambigua* and *fulva*, both of Swainson, the build of the shell is the same, but the details coarser and cancellation absent. *M. floccata*, Rve., is allied in the character of its marking, as its name would imply, but here, again, the somewhat ventricose whorls and the sutural arrangements differ.

*Mitra (Pusia) iteina* ‡, sp. n. (Pl. IV. fig. 7.)

*M. testa* ovato-oblonga, solidula, albo-straminea; anfractibus ad 11-12, ad suturas impressis, undique arcuissime costulatis, et spiraliter cancellatis, interstitiis quadratis, ultimo anfractu infra

\* Journ. of Conch. vi. 1891, p. 406, pl. ii. fig. 5.

† *Vaticinator*, a seer or prophet.

‡ *iteivos*, basket or osier-work.

suturas stramineo, infra peripheriam fusco-zonato, versus basin spiraliter noduloso; apertura oblonga, labro paullum incrassato, columella 5-plicata, fere recta.

Long. 23, lat. 8.75 mm.

*Hab.* Persian Gulf, Henjam Island, 10 fathoms.

Allied to this little species are those of the group of which *M. multcostata*, Sw., may be taken as an exponent. It is much narrower in form than this species, the beautiful shining riblets and decussating cancellations so regularly disposed, with the white stramineous and fuscous zoned spiral bands, serving to characterize it. *M. sculptilis*, Reeve, is of somewhat similar build, but here the interstices alone are latticed, the ribs remaining clear. In *iteina* there is complete cancellation, and the same obtains in *M. dædala*, Rve.

*Lamellaria (Chelynotus) berghi*, Desh.

(Pl. IV. fig. 8.)

*Lamellaria berghi*, G. P. Deshayes, Moll. de Réunion, 1863, p. 77, pl. ix. figs. 18-20.

I figure what appears to be a non-adult form of *berghi*, Desh., a most fragile, delicate, vitreous shell, with bluish tinge, perfectly translucent, apex mamillate, very minute, measuring alt. 9, diam. 8 mm. So many endemic species or forms, closely allied to and yet specifically distinct from others ranging further south, have been recently discovered in what might be termed the "cul de sac" of the Persian Gulf, that it is quite possible that, when mature, this may present characteristics for differentiation; but, at all events, it being the first time a member of this group has been reported from these seas, a record of its occurrence is interesting. A very few examples were collected, all live shells, similar in size and all other respects. No exact locality is given otherwise than "Persian Gulf."

*Melanella lamprea* \*, sp. n. (Pl. IV. fig. 9.)

*M. testa parva, attenuata, delicata, pellucida, pallide olivacea, lævi; anfractibus 11, ad suturas impressis, ventricosulis, perlævibus, diaphanis, ultimo tres anfractus approximatos exæquante, versus basin leniter declivi; apertura oblonga, labro haud effuso, recto, margine columellari obliquo, simplice.*

Long. 6, lat. 1.50 mm.

*Hab.* Persian Gulf, probably off Shaikh-Shuaib Island.

\* λάμπρος, shining.



A very delicate pellucid Eulimoid, as the specific name chosen denotes. It indeed seems fatuous to be now compelled to group the members of this genus of ivory whiteness and delicacy under a name so ill-chosen, and suggestive of Cimmerian darkness!

*Mucronalia aethria* \*, sp. n. (Pl. IV. fig. 10.)

*M. testa* parva, perlævi, diaphana, nitidissima, oblongo-fusiformi; anfractibus ad 12, quorum apicales 2 simpliciter heterostrophii, his 3 proximis attenuato-caudatis, cæteris ad suturas vix impressis, leniter accrescentibus, ultimo longitudine tres approximatos anfractus æquante; peristomate tenui, columella obliqua, apertura ovato-oblonga.

Long. 5, lat. 1.50 mm.

*Hab.* Persian Gulf, Henjam Island, 40 fathoms, 1906.

This *Mucronalia* is a plain, extremely smooth and shining little species, hardly impressed suturally, the upper whorls much narrowed and slightly caudate, while the nuclei are heterostrophe. Three other species are found in these seas, as follows:—

*M. bizonula*, Melv. Proc. Malac. Soc. vii. 1906, p. 73, pl. vii. fig. 8.—A minute twice-banded species, found in the Gulf of Oman at 156 fathoms and since recorded by Mr. C. Hedley † from Mast Head Reef, Queensland, 17–20 fathoms.

*M. lepida*, Melv. *ibid.* p. 72, pl. viii. fig. 31.—An ovate, small form from the same locality. Entirely white and semipellucant.

*M. oxytenes*, Melv. *ibid.* vi. 1904, p. 163, pl. x. fig. 13.—Larger than the last in all its parts. Also from the Gulf of Oman, dredged from deep water.

*Turbonilla exilispira* ‡, sp. n. (Pl. IV. fig. 12.)

*T. testa* alba, minuta, perattenuata, semipellucant; anfractibus 13, quorum 3 apicales, valide heterostrophii, cæteris angustis, ad suturas impressis, arcte oblique costulatis, costulis ad basin evanidis, interstitiis lævibus, ultimo vix latiore; peristomate recto, tenui, apertura squarrosula, columella recta.

Long. 4, lat. .75 mm.

*Hab.* Karachi.

Almost as narrow as *T. angustissima* §, Melv., from the

\* *αἰθριος*, clear, bright.

† Proc. Linn. Soc. N.S.W. 1907, vol. xxxii. p. 505.

‡ *Exilis, spira*, with slender spire.

§ Proc. Malac. Soc. vol. vi. 1904, p. 55, pl. v. fig. 13.

Gulf of Oman, 156 fathoms, with which alone it seems comparable, this little species can easily be recognized by its pinched form, its straight peristome and squarrose aperture, and longitudinal oblique riblets far more close and numerous than obtain in its ally. Both have similarly constructed apical whorls. It only occurred very rarely at the above locality.

*Turbonilla patruelis*, sp. n. (Pl. IV. fig. 13.)

*T. testa minuta*, gracili, subpellucente, attenuata, nitida; anfractibus ad 14, quorum 3 apicales valide heterostrophii, cæteris suturaliter impressis, ventricosus, longitudinaliter arcte costulatis, interstitiis sub lento spiraliter multistriatis, ultimo anfractu ad medium leniter castaneo-zonato, costulis rectis; apertura parva, peristomate tenui, columella fere recta.

Long. 5, lat. 1.25 mm.

*Hab.* Gulf of Oman, Charbar, 5 fathoms.

Resembling *T. materna*, Melv., but moulded upon an altogether smaller and more delicate scale, the whorls being semipellucid, as opposed to the opaque white of the more solid *materna*, while the longitudinal riblets are proportionately more frequent. Around the centre of the riblets runs a very faint spiral chestnut band or line. In this particular it is comparable with *T. uncinata*, Melv., than which it is thinner and smaller and more multicostate.

*Turbonilla thryallis* \*, sp. n. (Pl. IV. fig. 14.)

*T. testa candida*, compacta, nequaquam pellucida, lævissima, attenuata; anfractibus ad 15, quorum apicales 2-3 incumbenti-heterostrophii, ventricosus, ad suturas multum impressis, arcte longitudinaliter recte costulatis, costulis, simul ac interstitiis, perlævibus, numero anfractum apud ultimum 27, ad basin evanidis; peristomate tenui, columella recta, apertura angusta, squarrosula.

Long. 7, lat. 1.75 mm.

*Hab.* Gulf of Oman, Charbar, 40 fathoms.

A very neat and elegant species, pure opaque milky-white, exceedingly smooth and shining throughout, with impressed sutures and ventricose whorls, the longitudinal riblets being close and numerous—twenty-seven may be counted on the body-whorl. Labrum and columella straight, mouth quadrate and narrow.

\* *θρύαλλis*, white pith or wick of a candle, from the fancied resemblance.

Allied most nearly to the much larger *T. candida*, Ad., and also to *T. materna* and *unicincta*, Melv. From the last of these it differs in more frequent costulations and absence of any spiral coloured band; from *materna* in greater delicacy of substance, and also in the straight smooth riblets being closer and almost double in number.

*Turbonilla umbrina* \*, sp. n. (Pl. IV. fig. 11.)

*T.* testa attenuata, solidula, compacta, sordide brunnea, lævi; anfractibus 15-16, inclusis apicalibus heterostrophis, omnibus ad suturas impressis, undique arcte costulatis, costis crassis, rectis, interstitialiter superficie lævi, ultimo anfractu infra peripheriam lævigata, costis evanescentibus; apertura fere rotunda, parva, labro vix effuso, columella recta.

Long. 8, lat. 1.75 mm.

*Hab.* Karachi, 1906.

A somewhat coarsely built *Turbonilla*, of a dull brown colour throughout; whorls fairly impressed suturally, longitudinal riblets frequent, straight, close, interstices quite smooth; mouth, proportionately speaking, small, roundish, columellar margin straight, outer lip hardly effuse. It was very rare at the above locality.

*Eulimella squarrosula*, sp. n. (Pl. IV. fig. 16.)

*E.* testa alba, delicata, tenui, anguste fusiformi, versus apicem paullum caudata; anfractibus ad 14, quorum apicales 3 valide heterostrophis, cæteris paullulum ad suturas impressis, lævissimis, sub lente longitudinaliter albo-strigatis, ultimo anfractu duos proximos longitudine exæquante; apertura squarrosa, peristomate tenui, columella fere recta.

Long. 4.50, lat. 1 mm.

*Hab.* Persian Gulf, Mussandam, 55 fathoms.

A species plain in form, hardly impressed suturally; whorls smooth, straight; mouth square, outer lip and columella nearly straight. This differs from all the eight species hitherto included in this fauna, perhaps coming nearest to *E. venusta* †, Melv., distinguished by its elegant pagodiform whorls.

\* *Umbra*, shade, from the dusky colour.

† Proc. Malac. Soc. vol. vi. 1904, p. 56, pl. v. fig. 15.

*Styloptygma clymene*\*, sp. n. (Pl. IV. fig. 15.)

*S.* testa parva, tenui, alba, perlævi, elongata, supra brevicaudata; anfractibus ad 9, quorum apicales duo laterali-heterostrophii, cæteris ad suturas impressis, pernitidis, ultimo  $\frac{1}{3}$  longitudinis totius æquante; apertura parva, ovato-rotunda, labro recto, columella fortiter uniplicata.

Long. 5, lat. 1.25 mm.

*Hab.* Persian Gulf, Mussandam, 55 fathoms.

A somewhat stouter species than the allied *S. cometes*, Melv., which is more caudate, and subpellucid. I think it is right to place it in the same genus; by some it might be included in *Syrnola*.

*Cingulina secernenda*, sp. n. (Pl. IV. fig. 17.)

*C.* testa minuta, attenuata, oblonga, alba; anfractibus ad 9, quorum tres apicales, heterostrophii, læves, lacteo-vitrei, cæteris undique uniformiter arete spiraliter carinati et tornati, carinulis rotundatis, interstitialiter sub lente alveolatis, supernis duabus, ante et penultimo tribus, ultimo septem carinulis præditis; apertura oblongo-ovata, peristomate paullulum incrassato, albo, columella omnino simplice.

Long. 3.50, lat. 1 mm.

*Hab.* Karachi.

Very like, superficially, to *Oscilla indica*, Melv.; but wanting the columellar plait.

An *Oscilla* occurred, likewise, on the telegraph-cable in the Gulf of Oman, at 43 fathoms, resembling this species, but more elongate than *O. indica*, with the same character of tornate whorl ornamented with spiral carinæ, columella strongly once-plicated; long. 4.75 mm. This we have placed with our *O. faceta* †, as probably exemplifying the adult state of that species. The mouth, however, is smaller and rounder, and there are other slight differences; but nothing can be decided till more specimens are obtained.

\* *Clymene*, a Nereid, daughter of Oceanus and Tethys, and mother of Phaeton.

† Journ. of Malac. vol. xi. 1904, p. 82, pl. viii. fig. 10.

RISSOINA, d'Orb., 1840.

§ CHILIOSTIGMA, subgen. nov.

*Rissoina refugium*, sp. n. (Pl. V. fig. 20.)

*R.* testa isosceliformi, supra attenuata, alba, nitida, solidula; anfractibus ad 11, apicalibus lævibus, nitentibus, cæteris suturaliter impressis, ventricosulis, undique arcte et minute longitudinaliter striato-liratis, striis paullum obliquis, interstitiis regulariter et arctissime spiraliter puncturatis, punctis minutis, ultimo anfractu infra peripheriam curto, abbreviato; peristomate albo, incrassato, lævi, subtriangulari, paullum effuso, fere continuo, ad basin compresso, crassiore; columella obliqua, apertura subovata.

Long. 12, lat. 4 mm.

*Hab.* Gulf of Oman, lat. 24° 50' N., long. 56° 54' E.; 156 fathoms.

A remarkable species, which seems worthy of separate subgeneric rank, coming, it is true, near certain members of subgen. *Zebina* or *Zebinella*, but differing in the close longitudinal striation and interstitial close spiral pitting, the puncturations being very regular and minute. From these circumstances I propose the subgenus *Chiliostigma* \*.

The nearest approach I can find in this large genus to our species is *R. mottezi*, Bavay †, from Jamaica, very recently described. I have only seen figure and description. It is more decidedly costulate, but the deep spiral pitting is represented, and I would consider it to belong to the same new subgenus.

*Amphithalamus psomus* ‡, sp. n. (Pl. V. fig. 19.)

*A.* testa minuta, oblonga, solidula, fusca; anfractibus 5, quorum apicalis minutus, cæteris arctissime spiraliter striatis, ultimo paullum elongato; apertura subrotunda; peristomate fere continuo, læte fuscescente, nitido, paullum expanso; columella simplice.

Long. 3·25, lat. 1·75 mm.

*Hab.* Mekran Coast, near Gwadûr.

A very small, dark brown shell, with slightly expanded and reflected lip, very closely microscopically spirally striate throughout. It has several allies in this region—*columen*,

\* χίλιος, στίγμα, thousand-pitted.

† Journ. de Conch. 1917, p. 107, pl. iii. fig. 15.

‡ ψῶμος, a morsel or tit-bit.

*aristæi*, *elspethæ*, and others. It differs from all in its compact form, brown colour, and slightly expanded lip.

*Fossarus eutorniscus* \*, sp. n. (Pl. V. fig. 21.)

*F. testa* perminuta, solidiuscula, sordide straminea, ovata; anfractibus 4, quorum duo apicales bulbosi, albi, lævissimi, penultimo 2- ultimo 5-carinato, videlicet, carina prima infra, juxta suturas, secunda et tertia ad peripheriam, quarta et quinta circa umbilicum versus basin, interstitiis spiraliter minute ad profunde punctatis, umbilico anguste profundo; apertura rotundata; peristomate incrassato, rotundo, continuo; margine columellari simplice.

Alt. 1.50, diam. 1.50 mm.

*Hab.* Karachi.

Probably the smallest species of the genus, of which we have only seen five or six examples, varying very slightly in size. Though so minute, the sculpture is most elaborate, especially of the body-whorl, which possesses five spiral keels, the first just below the sutures, second and third at the periphery, fourth and fifth round the umbilicus; these keels are very incrassate, proportionately speaking, and the interstitial spaces between the second and third and fourth and fifth keels are spirally, regularly, deeply punctate. Of the same general form as *F. elegans* †, Verrill & Smith, from U.S.A. Atlantic Coast, but much smaller.

*Fossarus (Couthouyia) cancellarius*, sp. n.  
(Pl. V. fig. 22.)

*F. testa* parva, alba, tenui, ovato-oblonga; anfractibus 6, quorum apicales 2 vitrei, læves, mamillati, cæteris 4, ad suturas multum impressis, ventricosulis, undique minute et pulcherrime regulariter cancellatis, interstitiis quadratulis, ultimo anfractu cæteros permultum exsuperante; umbilico perparvo, angustissimo; apertura ovata, peristomate tenuissimo, fragili, columella simplice, obliqua.

Long. 3.50, lat. 2 mm. (sp. max.).

*Hab.* "Persian Gulf."

A very fragile, delicate shell, six-whorled, these being swollen and ventricose, the whole surface beautifully minutely cancellate; outer lip thin, slightly effuse; aperture oval,

\* *εὐ τορνίσκος*, well-turned.

† Trans. Connect. Acad. v. p. 522, pl. xlvii. fig. 38 (1882).

umbilicus very small and narrow, columella oblique. The nearest approach to this may be *F. (Couthouyia) obtusa*, A. Ad., from California, by some authors deemed an *Isapis*; but this is a far coarser species in character and build. I possess a large series of this and allied genera, very many yet unnamed, and neither among these nor yet in the British Museum have I been able to find its match.

*Triphora incolumis*, sp. n. (Pl. IV. fig. 18.)

*T. testa* cylindrico-fusiformi, pallide straminea, solidula; anfractibus 16-17, quorum apicales 5 pulchre et minute longitudinaliter striati, paullum decussati, apice ipso lævi, deplanato, cæteris ad suturas profunde impressis, lateribus paullulum convexis, quatuor supernis bi-, his proximis triseriatis, ordinibus nodulato-gemmatis decoratis, ultimo anfractu serie quarta prædito, gemmis interdum versus basin evanidis, circa basin tribus liris succinctis; apertura quadrata, peristomate tenui, canali brevi, paullum recurvo.

Long. 10, lat. 3 mm.

*Hab.* Persian Gulf: Fao Cable, and along the north coast; not rare.

A fine species, of pronounced character. Cyliandro-fusiform in shape, with channelled sutures, whorls (including the five nuclear, three of which are very finely striate) 16-17 in number, the lower whorls all ornamented with three equal spiral regular rows of gemmæ, shining, round, large proportionately; the body-whorl possessing four, the lowest of them sometimes has the gemmæ partly evanescent, the base being encircled with spiral plain ridges. Aperture somewhat squarrose, peristome thin, canal shortly recurved, pronounced. It may be compared with *T. rufula*, Watson, a somewhat smaller species\* (long. 7.5 mm.) from Wednesday Island, Torres Straits. This is much of the same sculpture, with channelled suture, the shell being of a ruddy yellow tint throughout. It differs from *T. idonea*, M. & St., not only in the channelled sutures and greater breadth of contour, but in the mouth being more contracted. We have seen a live albino form from Fao; in this the fourth row of noduled gemmæ at the periphery of the basal whorl is extremely distinct and perfect.

\* 'Challenger' Exp. xv. p. 566, pl. xlii. fig. 2.

*Triphora interpres*, sp. n. (Pl. V. fig. 23.)

*T.* testa elegantula attenuato-fusiformi, gracili, cinerea; anfractibus ad 20, quorum 5 apicales, apice ipso pallide fusco, lævi, his proximis pulchre cancellatis, ochraceo-fuscis, cæteris leniter et anguste ad suturas impressis, lateribus fere rectis, tribus spiralium gemmularum ordinibus arcte et regulariter præditis, ordine medio minorum, superficie hic illic castaneo-tessellato, ultimo circa basin bilirato; apertura parva, semicirculari, canali conspicuo, brevi, recurvo.

Long. 11, lat. 2.25 mm. (sp. max.).

*Hab.* Persian Gulf, Mussandam, 55 fathoms.

A rare species, very gracefully attenuate, many (20 or more) whorled, the apical being five in number, ochreous-brown and finely cancellate in young specimens, but soon getting worn, the remainder slightly impressed suturally, with three spiral bands of gemmuled nodules, those on either side of the sutures being the largest and most pronounced, the median row smaller; the body-whorl has but three gemmuled rows in all the examples we have examined, the fourth row, at the periphery, being a simple ridge. The colour is ashy-white, flecked with pale chestnut dashes over the whorls at certain intervals. Mouth small proportionately, semicircular; peristome thin, canal short, recurved.

\* \* \* \*

In the former enumeration of the species of this genus occurring in the Persian Gulf area five only are mentioned, viz.:—

*T. acuta* (Kien.),  
*T. cingulata* (A. Ad.),  
*T. corrugata* (Hinds),  
*T. idonea*, M. & St.,  
*T. perversa* (L.).

Of these, *acuta*, Kien., we have identified with the aid of specimens in the British Museum, assisted by the excellent figure in 'Coquilles Vivantes.'

It is common at Karachi, and known by the dark brown spiral zone of gemmuled nodules at the sutures. A small species; may possibly be an extreme form of *perversa*.

This last-named is protean, and of extremely wide distribution. We have examined two or three hundred examples at least, and find it impossible to get a definite grasp of any essential distinctive character. Mr. le Brockton Tomlin



kindly gave me his opinion on the subject—that it was unlikely that the Gulf fauna contained a single species found in the Mediterranean; but since we hear of *perversa* occurring on the Pacific coast, in West America, we dare not accept this theory as completely valid, and prefer to leave the name unaltered. One interesting form of this mollusc inhabiting the coast near Karachi is larger than the normal type which so commonly extends from Bombay northwards, and measures long. 9, lat. 2 mm.; whorls 15, nuclear small, slightly caudate; whorls impressed suturally, of the usual pattern, 3-seriate, with spiral small gemmulate nodules; colour pale stramineous, nuclear whorls pure white; body-whorl four-rowed, two raised ridges around the base. A narrower shell than *incolumis*, and not so gracefully attenuate as *interpre*. To this variety of *perversa* the name *persica* might be attached.

*T. idonea*, M. & St., is a white chalky shell, of deep water. It has not occurred plentifully, and perhaps comes nearest to *interpre*.

*T. corrugata*, Hinds, is, next to the ordinary form of what we still call *perversa* (L.), the most abundant and striking of the Gulf *Triphoræ*. It is found all along the coast, and with it we now merge what was erroneously called *cingulata* in our first Catalogue.

To these *T. concatenata*, Melv., a small, very attenuate species, has been added, and the occurrence of *T. concors*, Hinds, been noted. Therefore, including the two new species *incolumis* and *interpre*, eight species of this genus are now recorded, of which, so far as is known, three are endemic in these seas.

*Leptothyra miltochrista* \*, sp. n. (Pl. V. fig. 24.)

*L. testa* solida, suborbiculari, fulvo-rubescente; anfractibus 5, quorum tres apicales, læves, albi, cæteris duobus undique arete spiraliter liratis, liris uniformibus; apertura rotunda; peristomate crassiusculo nitido, albo, simul ac margine columellari; umbilico anguste sed profundo, ejus margine nequaquam crenulato.

Alt. 3·75, diam. 4 mm.

*Hab.* "Persian Gulf," probably off Henjam Island.

A small, solid, orbicular, reddish-yellow species, with shining white peristome and columella surrounding its circular aperture; margin of the deep but narrow umbilicus not, as is so often the case, crenulate, but quite simple. The

\* *μυλτόχριστος*, in allusion to the red-ochre colour.

whole surface of the two lower whorls is closely spirally lirate. Allied to *L. rosea*, Pilsbry, from Japan, but smaller.

Exclusive of this new species, five others of this genus have, so far, been reported from this region, viz. :—

1. *L. filifera*, Desh.

This needs further investigation. I cannot find any specimens in the collection so named, as I understand, by the late Mr. E. A. Smith.

2. *L. læta*, Montr. = *costulosa*, G. B. Sowb.

In three or four dredgings in Gulf of Oman.

A very prettily painted shell, depresso-discoid in form, spirally closely lirate, variegated with rose-coloured spots radiating round the surface. Also a New Caledonian species.

3. *L. munda* (H. Adams) COLLONIA ; Sowerby, Thes. Conch., *Turbo*, pl. xiii. fig. 163.

Persian Gulf.

Very minute.

4. *L. pilula*, Dunker.

Maskat (Muscat) and Charbar, 5–6 fathoms. Also Bahrein, and in two or three soundings, Gulf of Oman.

A heavily built little round shell, with shouldered whorls, and buff or cinereous spiral spotting and blotches on a dull white ground. Umbilicus margin coarsely crenulate.

5. *L. rubens*, Melv. & Stand.

Persian Gulf, Mussandam, 30 fathoms; live examples. Also at 60 and 156 fathoms in the Gulf of Oman.

A somewhat smooth, angled species, shining, reddish in colour, very abundant at 156 fathoms, rarer at a less depth.

Others very possibly occur. The species are hard to discriminate, and may vary more in sculpture and colouring than is supposed to be the case.

The genus is mostly Eastern, but several striking species occur in the Sandwich Isles and western coasts of America.

*Minolia charmosyne*\*, sp. n. (Pl. V. fig. 25.)

*M. testa* gradata, conica, solidula, tornata, fusco-variegata; anfractibus sex, quorum duo albi, minuti, apicales, læves, cæteris infra suturas acute carinatis, supernis una, ultimo anfractu duabus carinis prædito, inter has spiraliter unilirato, simul ac ad basin et circa umbilicum profundum, sed angustum, multis liris decorato, interstitialiter minute longitudinaliter tenuiter rugosistriatulo; apertura rotunda, peristomate tenui, columella paullulum reflexa.

Alt. 5, diam. 4 mm.

*Hab.* Karachi.

A little, prettily variegated and acutely tornate *Minolia*, of which we have also seen an albino variety which might be termed var. *albinella*. The upper whorls are smooth, the body-whorl alone showing very fine longitudinal striæ interstitially, while round the narrow but deep umbilicus this is more pronounced, causing a delicately shagreened appearance; the spiral liræ here are three or four in number, and four between the periphery and the base.

*Minolia (Conotrochus) eutyches* †, sp. n.

(Pl. V. fig. 26.)

*M. testa* oblongo-fusiformi, cinerea, delicata; anfractibus 8, quorum apice ipso minuto, subplanato, cæteris ad suturas multum impressis, centraliter carinatis, carinam supra mediam spiraliter lente uniliratis, et, infra, juxta sutura, carina secunda forti, sed minus prominula præditis, undique longitudinaliter minute et aretissime lamellosis, cinereis, ad carinas et supra tessellatomaclatis, ultimo tribus carinis decorato, versus basin paullum excavato, concentricè lirato; umbilicis profundo, angusto; apertura rotunda, peristomate continuo, tenui.

Long. 5, lat. 2.25 mm.

*Hab.* Persian Gulf, Muscat, 10–30 fathoms.

Allied to *C. holdsworthianus* ‡, G. & H. Nevill, which occurs at Karachi, with a wide range extending to Singapore (*Archer*). From this it differs in form, being more oblong, in colour, no bright tinting, in 8 against 5 whorls. Several examples occurred, all very similar.

\* χαρμοσύνη, a delight.

† εὐτυχής, fortunate.

‡ Journ. Asiatic Soc. Bengal, 1871, p. 3, pl. i. fig. 18.

*Euchelus veniolum* \*, sp. n. (Pl. V. fig. 27.)

*E. testa* perparva, ovato-conica, imperforata, candida; anfractibus 7, quorum 3 apicales, apice ipso prominulo, duobus huic proximis longitudinaliter oblique liratis, cæteris apud suturas profunde impressis, supernis spiraliter 4-, ultimo 9-liratis, liris regularibus, superficie longitudinaliter oblique cancellato-decussata ad juncturas lirarum pulchre gemmato-nodulosis, gemmis nitidis, infra peripheriam ad basin minoribus, concinnis, regularibus; apertura rotunda, peristomate fere continuo, intus denticulato, margine columellari excavata.

Alt. 4.50, diam. 3 mm.

*Hab.* Gulf of Oman, Charbar, 5 fathoms.

A small white *Euchelus*, normal in general characters, beautifully and regularly spirally-lirate and decussate; at the point of junction the gemmulate nodules are round and shining. Mouth small, roundish; peristome almost continuous; columella excavate.

*Cylichna euthlasta* †, sp. n. (Pl. V. fig. 28.)

*C. testa* perparva, fragilissima, ovato-cylindrica, alba, lateribus fere rectis, undique spiraliter arete tenuistriata, striis sub lente minutissime depunctis; apertura versus basin paullum dilatata, supra angusta, vertice profunde umbilicata, margine rotundato, columella simplice.

Alt. 2.75, diam. .75 mm.

*Hab.* On rocks at low tide, Karachi.

Comparable with three species described by the late Mr. Edgar Smith (but unfortunately not figured), all of which occur in the same seas, viz., *consanguinea*, *perpusilla*, and *pumilissima* ‡.

The first of these is longitudinally curvedly striate, vertex encircled with acute carina round the umbilicus, lip slightly contracted in the centre.

*Perpusilla* is smaller and with quite smooth surface; while *pumilissima*, equally minute (alt.  $1\frac{1}{2}$ , diam.  $\frac{3}{4}$  mm.), possesses longitudinal curved ridges and very dilated aperture basally.

The specimen selected for the type was accidentally broken after being figured, and a smaller example has to be considered the available co-type.

\* *ξενίολον*, a little gift.

† *εὐθλαστος*, fragile.

‡ Ann. & Mag. Nat. Hist. (4) ix. pp. 352-3.

*Oxyñoë omega*, sp. n. (Pl. V. fig. 29.)

*O.* testa ovata, cartilaginea, lævigata, epidermide tenui sordide straminea induta, postice contracta, spira depressa, acute truncatula, antice dilatata, rotundata, anfractu ultimo tumescente, labro fere recto, leniter ad basin rotundato, pertenui.

Alt. 6, lat. 4 mm.

*Hab.* Gulf of Oman, Charbar, 5 fathoms.

Several examples, some of which seem slightly malformed.

*O. delicatula*, Nevill \*, appears the nearest ally. This is reported from both Ceylon and Australia, and about the same size as the proposed new species; the last whorl is, however, much less tumid and full, and the posterior contraction more marked.

The name *Oxyñoë*, Rafinesque, 1819, has many years' precedence over *Icarus*, Forbes, 1844, and the better-known *Lophocercus*, Kroken, 1847.

*Cylindrobulla systemma* †, sp. n. (Pl. V. fig. 30.)

*C.* testa parva, elongato-cylindrica, tenuissima, membranacea, superficie undique lævi, subpellucente, ochraceo-straminea; anfractibus 3, apicalibus duobus inclusis deplanatis, ultimo maxime involuto; apertura angustissime supra, ad basin multum latiore, subtruncatulo.

Long. 6·25, lat. 3·75 mm. (sp. max.).

*Hab.* Gulf of Oman, Mekran Coast, off Charbar, 40 fathoms.

In form resembling the much smaller European species

*C. fragilis*, Jeffr. *C. sculpta*, Nevill ‡, is also comparable. This species, much of the same dimensions, though a little broader proportionately, is very finely striate, our species being quite smooth.

*Dentalium tomlini*, sp. n. (Pl. V. fig. 31.)

*D.* testa mediocri, multum incurva, longitudinaliter regulariter costata, costis 11-12, interdum versus aperturam anticam evanescentibus, interdum undique fortibus, regularibus, interstitiis lævibus, paullum excavatis, superficie nunc albescente, nunc ochro-carnea, apice anali in speciminibus haud adultis perminimo, aliter sub lente bifisso, antico nequaquam expanso.

Long. 22, diam. antic. 3, post. 1 mm.

\* Journ. Asiatic Soc. Bengal, 1869, p. 67, pl. xiii. figs. 5-5 c.

† *σύνσπριμμα*, a roll.

‡ Journ. Asiatic Soc. Bengal, 1869, p. 68, pl. xiii. figs. 3-3 a.

*Hab.* Karachi.

Allied to *D. porcatum*, Gould, from Hongkong, to which at first I was inclined to allocate it. I am particularly indebted to Mr. J. R. le B. Tomlin for having, at my request, carefully examined and compared it with its congeners in the British Museum, and his verdict is as follows:—"I examined the single example of *D. porcatum* in the Cumingian collection, which is, I fancy, a co-type, and has a label, pasted underneath, in what I believe to be Gould's handwriting. Your Karachi shell is very similar, but more tapering, and possesses ribs running the whole length of the shell, whereas in *porcatum* the alternate ribs stop abruptly about  $\frac{2}{3}$  of the way" (*in litt.*, Aug. 10, 1916). It gives me sincere pleasure to baptize this neat species with Mr. le Brockton Tomlin's name.

*Divaricella cypselis*\*, sp. n. (Pl. V. fig. 33.)

*D.* testa rotundo-globulari, parva albo-cinerea, delicatula, antice dorsaliter excavata, postice leniter declivi, deinde circa marginem ventralem rotundata, umbonibus contiguis, parvis, superficie, spatio centrali valvæ utriusque excepto, arcuissime concentricè lirata, et antice, simul ac postice radiatim decussata, ad juncturas lirarum gemmata, valvis profunde convexus.  
Alt. 4, lat. 5, diam. 2.45 mm.

*Hab.* Karachi, 20-30 fathoms.

A small rounded species, with finely sculptured divaricate liration, the surface of both valves being smooth centrally, and finely radiately decussate both anteriorly and posteriorly. The umbones are small, acute, shining.

*Phacoides malcolmensis*, sp. n. (Pl. V. fig. 32.)

*P.* testa parva, fere rotunda, alba, arcuissime concentricè lamellata, lamellis paullulum flexuosis, hic illic irregularibus, supra, juxta et infra umbones sub lente minutissime decussatis, umbonibus prominulis contiguis, parvis, antice paullum excavata, deinde rotundata, postice recte declivi marginem apud dorsalem, dentibus normalibus.  
Long. 9.25, lat. 10 mm. (sp. maj.).

*Hab.* Persian Gulf, Malcolm Inlet, 35 fathoms.

A small white species with a fugitive light olive epidermis, very closely lamellate throughout. Only two or three

\* *κίβητις*, a chest or box.

examples were dredged, and it is possible it may attain slightly larger dimensions, as we are not certain of these being adult.

*Cypricardia vertumnalium*\*, sp. n. (Pl. V. fig. 34.)

*C. testa sordide alba, solidula, polymorpha, oblonga vel ovata, nunc alta, ovata, umbonibus prominulis, nunc oblongo-depressa, umbonibus minutis, hic arcte concentrice lamellata, illic fere levigata, superficie longitudinaliter inter lamellas arcte striata, lamellis rudibus, postice sæpius incurvis, intus alba, nitida, sinu palliali lato, profundo, dentibus variatis, plerisque normalibus, interdum cardinali laterali absente, vel deformi.*

Alt. 26, lat. 22, diam. 13 mm. (sp. max.).

*Hab.* Karachi.

A polymorphic species which cannot exactly be matched with any other of the recent forms, with which we have carefully compared it, simple though its appearance and characters be. Through the kindness of Mr. G. B. Sowerby we have received a suite of specimens, all from the same locality, or collected by Mr. Townsend, and these each exhibit some varietal phase.

*Carditella concinna*, sp. n. (Pl. V. fig. 35.)

*C. testa perminuta, solidiuscula, æquivalvi, fere æquilaterali, subtriangulata, concinna, umbonibus contiguïs, margine dorsali antice excavatula, postice leniter declivi, deinde ventrali rotundata, costis longitudinalibus tredecim, latis in utraque valva, superficie undique arcte tenuiter striata.*

Alt. 1.75, lat. 2, diam. 1 mm.

*Hab.* Karachi.

An exceedingly small but neat little shell, the shape somewhat triangular, slightly excavate dorsally in front and posteriorly gradually sloping off to the rounded ventral margin. Slightly convex; both valves, almost equilateral, are provided with thirteen flattened ribs, the interstices being exceedingly narrow, all everywhere crossed by transverse very fine striæ. It occurred most rarely.

\* *Vertumnus*, the god of mutability, had festal days, entitled "*Vertumnalia*," dedicated in his honour.

## EXPLANATION OF THE PLATES.

## PLATE IV.

- Fig. 1. *Bursa gnorima*.  
 Fig. 2. *Alectryon (Phrontis) alcimus*.  
 Fig. 3. — (*Hima*) *protrusidens*.  
 Fig. 4. — (—) *gwatkinianus*.  
 Fig. 5. *Pisania townsendi*.  
 Fig. 6. *Mitra vaticinator*.  
 Fig. 7. — (*Pusia*) *iteina*.  
 Fig. 8. *Lamellaria (Chelynotus) berghi*, Desh. (juv.).  
 Fig. 9. *Melanella lampra*.  
 Fig. 10. *Mucronalia aethria*.  
 Fig. 11. *Turbonilla umbrina*.  
 Fig. 12. — *exilispira*.  
 Fig. 13. — *patruelis*.  
 Fig. 14. — *thryallis*.  
 Fig. 15. *Styloptygma clymene*.  
 Fig. 16. *Eulimella squarrosula*.  
 Fig. 17. *Cingulina secernenda*.  
 Fig. 18. *Triphora incolumis*.

## PLATE V.

- Fig. 19. *Amphithalamus psomus*.  
 Fig. 20. *Rissoina (Chiliosigma) refugium*.  
 Fig. 21. *Fossarus eutorniscus*.  
 Fig. 22. — (*Couthouzia*) *cancellarius*.  
 Fig. 23. *Triphora interpres*.  
 Fig. 24. *Leptothyra multochrista*.  
 Fig. 25. *Minolia charmosyne*.  
 Fig. 26. — (*Conotrochus*) *eutyches*.  
 Fig. 27. *Euchelus xeniolum*.  
 Fig. 28. *Cylichna euthlasta*.  
 Fig. 29. *Oxyñoë omega*.  
 Fig. 30. *Cylindrobulla systemma*.  
 Fig. 31. *Dentalium tomlini*.  
 Fig. 32. *Phacoides malcolmensis*.  
 Fig. 33. *Divaricella cypselis*.  
 Fig. 34. *Cypricardia vertumnalium*.  
 Fig. 35. *Carditella concinna*.

XVII.—*Descriptions and Records of Bees.*—LXXIX.

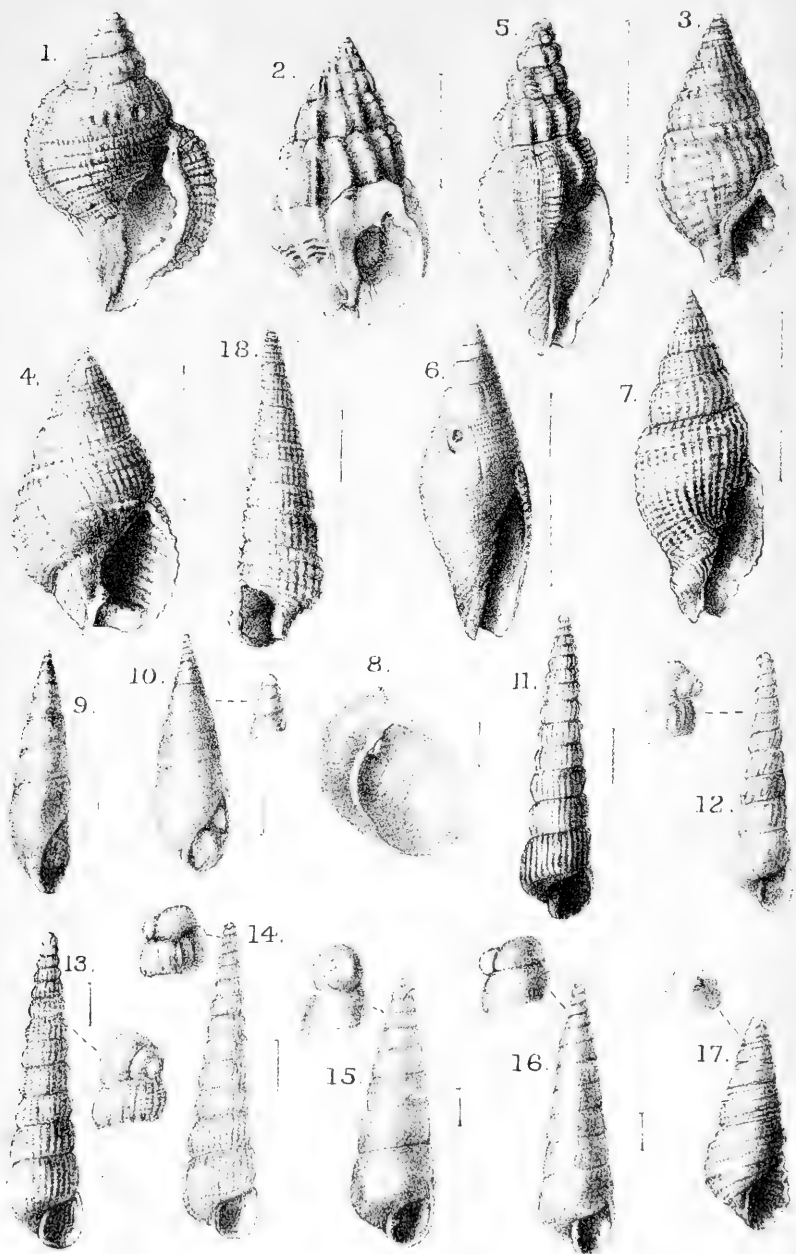
By T. D. A. COCKERELL, University of Colorado.

*Colletes gigas*, sp. n.

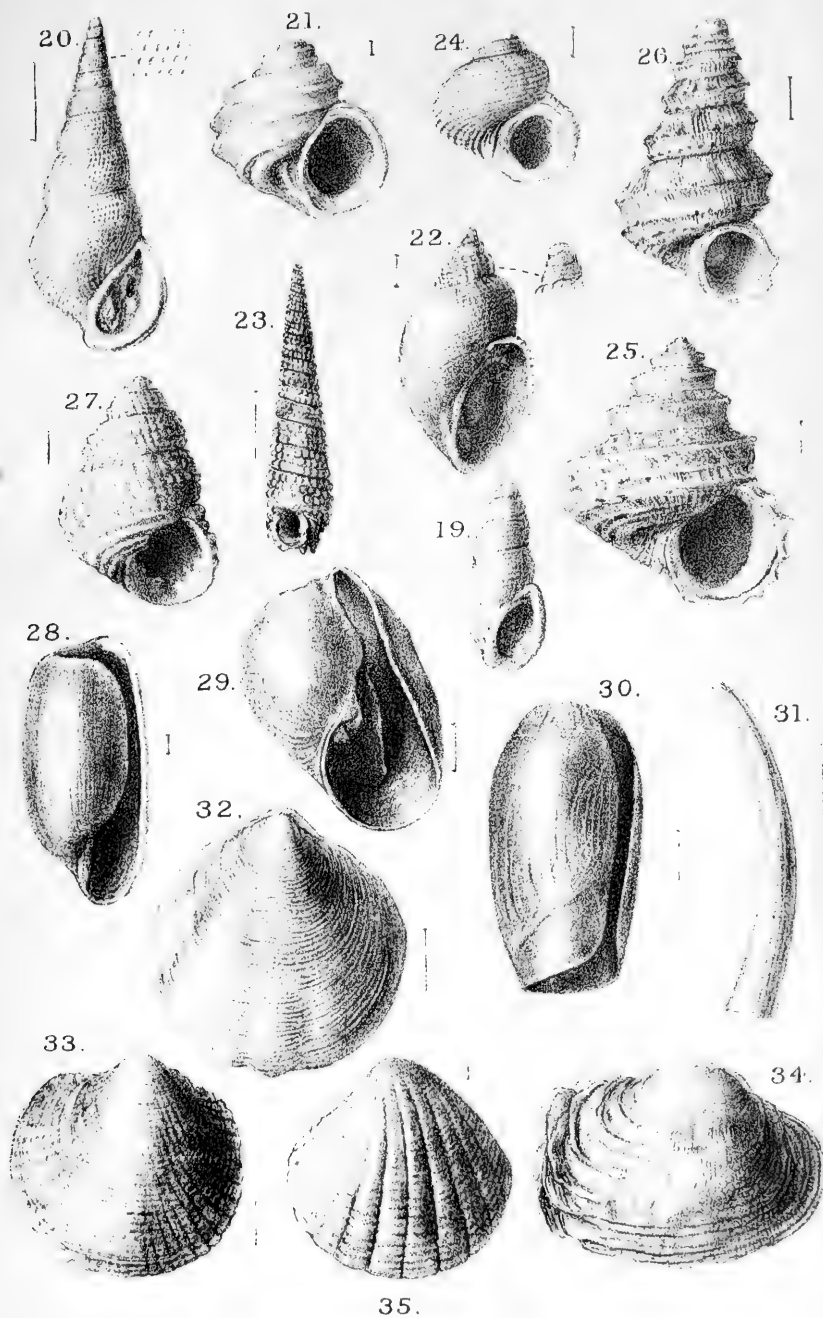
♀.—Length about 17 mm.; anterior wing 12 mm.

Black, including legs and antennæ, the middle of flagellum faintly reddish beneath; tegulæ clear ferruginous; hair of











face pale fulvous, with some fuscous, of region about ocelli mainly fuscous, of cheeks pale but not white; clypeus longitudinally depressed in middle, coarsely punctured, with a marked tendency toward longitudinal ridges; malar space about half as long as broad; ocelli fulvous; vertex with very small irregular punctures; mesothorax strongly punctured; base of metathorax with coarse rugæ; thorax above with dense bright fulvous hair, sparsely tipped with fuscous; tubercles with fulvous hair, and a patch just behind tipped with fuscous; pleura with pale ochreous-tinted hair. Wings reddish hyaline, nervures and the small stigma ferruginous, radial nervure fuscous; second submarginal cell extremely broad, receiving first recurrent nervure in middle. Legs with pale ochreous-tinted hair; spurs ferruginous. Abdomen dullish, without distinct punctures; hind margins of segments broadly testaceous, and covered with appressed ochreous hair, but the first band is mainly on base of second segment; first segment with light fulvous hair on basal part; fourth and fifth segments with long fuscous hair before the light bands; venter thinly covered all over with ochreous hair.

Foochow, Fukien, China, Nov. 16, 1914 (*C. R. Kellogg*, 243). From Prof. C. F. Baker.

Something like *C. fodiens*, Kirby, but of gigantic size. *C. mongolicus*, Pérez, from Mongolia, has the red hair on thorax above, but it is very much smaller.

*Colletes friesei*, n. n.

*Colletes mongolicus*, Friese, Ann. Mus. Zool. Ac. Sci. St. Pétersbourg, xviii. (1913), p. xlix (not of Pérez, 1903).

*Megachile (Paramegachile) kobensis*, sp. n.

♀.—Length about 12 mm.

Black, with white hair, which is short and thin on head and thorax above, so that the general effect is grey. Abdomen with entire white hair-bands on segments 2 to 5; ventral scopa white (with a faint creamy tint, contrasting with the pure white of the dorsal bands), black on last segment; last dorsal segment straight in profile, with scanty short dark hair. Mandibles quadridentate, the basal half covered with white hair; clypeus convex, densely punctured, with a smooth shining median line, lower margin subangular on each side; supraclypeal area densely punctured, with a shining area in middle; flagellum obscure fuscous beneath,

except at base; mesothorax and scutellum dull, with small extremely dense punctures; metathorax with long white hair all over; tegulae dark rufo-fuscous, with a broad hyaline margin. Wings hyaline, faintly dusky; hind basitarsi moderately broad, the hair on inner side clear ferruginous. Abdomen finely punctured.

Kobe, Japan (*Baker*, 1449).

Not closely allied to any described Japanese species. In Friese's Palaearctic table it runs to *M. leucomalla*, Gerst., but has no dark hair on thorax. In the table of Oriental species it runs to *M. femorata*, Smith, but is larger and has black legs. Smith's species requires a new name, as follows:—

*Megachile femoratella*, n. n.

*Megachile femorata*, Smith, New Sp. Hym. Brit. Mus. (1879) p. 68 (India). Not *M. femorata*, Smith, 1853.

*Nomia rhododonta*, sp. n.

♀.—Black; postscutellum with a deeply bidentate process, the teeth red; abdomen with broad emerald-green bands, shot with vermilion, on hind margins of segments 2 to 4; clypeus and supraclypeal area carinate; wings reddish, second submarginal cell short, higher than broad. In all respects very close to *M. incerta*, Gribodo, but somewhat larger, with the large tegulae bright clear ferruginous, the mesothorax sparsely punctured with large and very small punctures, the upper border of prothorax and tubercles with light fulvous hair, and a large tuft of same before tegulae; hair of mesopleura ochreous-tinted; punctures of second abdominal segment not so dense.

Baton (Bouton?), Celebes (Queensland Museum, 54).

This appears to be identical with the species from Celebes mentioned in Trans. Amer. Ent. Soc. xxxi. p. 322, but not named.

*Melissodes hymenoxidis*, Cockerell.

Tolland, Colorado, Aug. 24, 1911 (*Cockerell*).

*Epeolus humillimus*, sp. n.

♂.—Length 6.5–7 mm.

Black, with the mandibles red except at base, a red spot at each side of labrum; tegulae, tubercles, knees, tibiae at apex, and the tarsi all ferruginous; mandibles bidentate;

maxillary palpi 2-jointed; antennæ black; clypeus densely and minutely rugoso-punctate; upper part of face covered with pure white hair; mesothorax and scutellum dull and rough, scutellum bilobed; mesothorax with the anterior and posterior corners, and a pair of well-defined broad bands anteriorly, with greyish-white pubescence; mesopleura with only the upper half densely pubescent; scutellum covered with white hair posteriorly. Wings with the apical margin dusky. Abdomen with the usual bands of creamy-white tomentum, those on apices of segments 1 to 5 narrowly interrupted in middle, on 2 to 4 concave anteriorly sublaterally, on 2 connected with a round patch at sides, on 5 reduced to a pair of transverse patches; band on sixth segment entire; black area on first segment a broad transverse band, obliquely truncate at each end.

Variety *a*. Bands on mesothorax anteriorly altered to broad suffused patches, partly coalescent.

Pullman, Washington State, Aug. 2, 1908 (*W. M. Mann*).

In Robertson's table (*Canad. Entom.* 1903, p. 288) this runs out, having the pleura below quite closely punctured, the scutellum bilobed, and the mandibles toothed. It may be compared with *E. interruptus*, Rob., but that is larger, with red legs and scape. *E. olympiellus*, Ckll., is larger, with the labrum entirely black and the tegulæ darker; it comes from the moist coast region, and evidently *E. humillinus* is its representative in the dry interior. The two may be found to intergrade in the country between.

*Nomia (Hoplonomia) expulsa*, sp. n.

♂.—Length about 12.5 mm.

Black, with the hind tibiæ (except a black spot) and tarsi dull ferruginous. Eyes reddish brown, strongly converging below; face covered with ochreous hair; flagellum dusky red beneath; head and thorax dorsally with rather coarse ochreous hair, ventrally with white hair, the transition gradual at sides; mesothorax and scutellum dull and rugose; postscutellum with a pair of long spines, red at end; tegulæ large, brown, with a broad whitish border. Wings dusky reddish; stigma (which is small) and nervures ferruginous; first r. n. joining second s. m. very near its end. Legs with whitish hair; hind femora enormously swollen, subglobose, conoid; hind tibiæ extremely short and stout, triangular, the spurs arising from the extremely produced inner apical corner; hind basitarsi greatly broadened,

broadest toward the base, where they are posteriorly concave. Abdomen dull and hairy, the hind margins of the first five segments (especially the fourth and fifth) whitened or pallid; before the light tegumentary bands is fuscous hair, except on the first segment, where the band itself is feebly developed.

“Guyane, Maroni” (Queensland Mus. 46).

This seems out of place in the Neotropical fauna, and I wondered whether it could be an Old World species with wrong locality-label. However, I fail to find any such species in the fauna of Asia or Africa, and the structure of the hind legs, most significantly the basitarsi, approaches that of the American *N. nortoni*, Cresson. Consequently I believe it is really an American insect.

*Melipona chrysura*, sp. n.

♂.—Length 9 mm.

Robust; head and thorax black, with short pale hair, ochreous dorsally; face dark, except that there is a reddish spot below each antenna, and the lower edge of clypeus is narrowly red; labrum and apical part of mandibles reddish; scape with a red spot at base and a less conspicuous one at apex; flagellum very long, ferruginous beneath; scutellum and axillæ clear fulvous; metathorax suffused with reddish; clypeus dull, but a polished shining band marking its upper end; tubercles fulvous; mesothorax dull, densely rugosopunctate, with two shining lines on each side, and a median line of greyish-white hair; scutellum dull; base of metathorax shining; tegulæ large, ferruginous. Wings reddish hyaline, stigma and nervures ferruginous. Legs more or less reddish, the anterior femora beneath and tibiæ in front, middle tibiæ at apex, and hind tibiæ suffusedly on inner side, ferruginous. Abdomen broad, dull orange, the first two segments combined with a very broad X-like dark brown mark, the upper arms of which reach the sides of first segment, but the lower arms go little more than halfway to sides of second; segments 3 to 5 dark at base; sixth dark with pale hind margin; venter pale fulvous suffusedly marked with fuscous.

Olokemeji, Ibadan, Nigeria (Queensland Mus., 55).

Nearest to *Trigona* or *Melipona tomentosa*, Friese, but larger, and differing in the details of coloration.



*Perdita interrupta*, Cresson.

Claremont, California (*Baker*; Pomona College, 227). This is the first definite locality; Cresson only gave "California."

*Prosopis littleri*, sp. n.

♂.—Length about 5.5 mm.

Rather slender; black, marked with pale lemon-yellow and bright ferruginous; face below antennæ, as well as labrum and mandibles, yellow; the lateral marks extend upward along orbital margin as a very narrow band, coming to a point about halfway up front; scape with a yellow band in front; flagellum ferruginous beneath; mesothorax and scutellum dull, with no punctures visible under a lens; base of metathorax dull, not sculptured; narrow line on prothorax above, and tubercles, white; tegulæ black. Wings dusky, first r.n. meeting first t.-c.; knees, anterior tibiæ (except sometimes a small spot), middle tibiæ (except a large patch behind), hind tibiæ at base and extreme apex, and all the tarsi (except extreme apex of middle and hind ones) ferruginous. Abdomen with the basal two segments bright ferruginous, the others black; the first segment is black at base, and the second has a large black patch on each side, or these markings may be practically obsolete.

George Town, Tasmania, March 1915 (*F. M. Littler*, 2593).

Nearest to the mainland *P. sanguinipicta*, Ckll., but easily known by the greater amount of red on abdomen.

*Prosopis mediovirens*, Cockerell.

Launceston, Tasmania, Feb. 13, 1916 (*Littler*, 2809). The male sent is 4.5 mm. long, which is larger than the type. New to Tasmania.

*Prosopis chlorosoma*, Cockerell.

Launceston, Tasmania, Feb. 13, 1916 (*Littler*, 2810, pars). New to Tasmania.

*Prosopis perhumilis*, Cockerell.

Launceston, Tasmania, Feb. 13, 1916 (*Littler*, 2810, pars), and a male, Feb. 12, 1914 (*Littler*, 2811). The occurrence of this species in Tasmania (*cf. Descr. Rec. Bees*, lxii. p. 54) is thus confirmed.

*Prosopis brevior*, sp. n.

*Prosopis perhumilis*, Cockerell, Mem. Queensl. Mus. v. (1916) p. 197 (Oxley, Brisbane), ♂.

I am now convinced that the Queensland supposed *perhumilis* must be separated. It is easily distinguished (♂) by the shorter clypeus and larger supraclypeal mark. In *perhumilis* the parallel-sided part of clypeus is higher than broad, in *brevior* it is very much broader than high. In *brevior* the lateral face-marks are longer, and the yellow stripe on scape is broader.

*Euryglossa tasmanica*, sp. n.

♀.—Length about 6.5 mm.

Head and thorax black without markings. Abdomen very dark reddish, with a large subtriangular yellow patch on each side of segments 2 to 5, those on 5 only narrowly separated in the middle line; mandibles yellow basally, beyond that ferruginous, and dark at apex; clypeus and supraclypeal area shining, sparsely punctured; supraclypeal area strongly elevated and angulate above; flagellum rather obscure red beneath; thorax only moderately shining, with scanty pale hair; mesothorax with minute very sparse punctures on a dullish ground; metathorax obscurely reddish; tegulae dark. Wings slightly dusky, stigma and nervures dull ferruginous, venation ordinary. Anterior and middle knees, anterior tibiae in front, and stripe on middle ones yellow or reddish-yellow. Abdomen shining; venter of abdomen rufo-testaceous, with no markings except that middle of first segment is piceous.

Launceston, Tasmania, 3 ♀, Dec. 27, 1915 (*Little*, 2806).

Related to *E. maculata*, Sm., from Swan River, but that has yellow legs.

*Callomelitta nigrofasciata*, sp. n.

♀.—Length about 9 mm.

Shining black, with lateral thirds of mesothorax (narrower posteriorly) terra-cotta red; anterior femora at apex, anterior tibiae (except a black mark behind) and their basitarsi red; apical plate of abdomen small and narrow, subclavate.

Very close to *C. littleri*, Ckll., but apparently not its male, on account of the paler (though strongly dusky) wings, the broad black band down middle of mesothorax, and the black

tegulae (in *littleri* these are clear red). The second sub-marginal cell is much narrower below than in *littleri*. The tubercles are black (red in *littleri*).

Launceston, Tasmania, Dec. 27, 1915 (*Littler*, 2272).

*Halictus erythrurus*, Cockerell.

Launceston, Tasmania, Dec. 19 and 25, 1915 (*Littler*, 2807). New to Tasmania.

*Halictus tasmaniae* (Cockerell).

St. Helens, Tasmania, Jan. 1-4, 1916 (*Littler*, 2808). The mesothorax is very faintly greenish.

*Trigona parastigma*, sp. n.

*Trigona stigma*, Cockerell, 'Psyche,' 1913, p. 11 (Las Sabanas, Panama).

A specimen from Maroni, French Guiana (Queensland Mus., 53), differs from the Panama and Guatemala insect by the larger, broader head, the sides of the face broadly and strongly white-pruinose. This must be the true *stigma*, of which Smith says, "head wider than the thorax, the face anteriorly having a silvery pile." In the other form, which I have hitherto regarded as *T. stigma*, the head is not so conspicuously broad, and while the face has a very thin pubescence, there is nothing to produce a white surface. The male from Trinidad seems to belong to *T. parastigma*. The two species are certainly very closely allied, and yet evidently distinct.

*Andrena ribifloris*, Viereck & Cockerell.

♀.—Variety with pale hair, the long hair on first two abdominal segments white.

Near Gresham, Colorado, at flowers of *Ribes saxosum*, June 8 (*W. P. Cockerell*).

*Andrena opacissima*, sp. n.

♀.—Length about 8 mm.; anterior wing 7.2 mm.

Dull black, the head and thorax with long white hair, faintly creamy dorsally; facial quadrangle broader than long; cheeks with very long hair; process of labrum small, obtusely pointed; clypeus with long hair, feebly punctured, minutely transversely striate; facial foveae rather broad,

warm reddish; antennæ black; vertex dull, not punctured; mesothorax dull, without any distinct punctures; area of metathorax dull, without plicæ; tegulæ piceous. Wings hyaline, the large stigma and nervures dull ferruginous; second s.m. broad, receiving first r.n. before middle. Legs black, with pale hair, that on inner side of hind basitarsi very pale ochreous. Abdomen broad, dull, with a slight satiny gloss, impunctate; second segment feebly depressed about two-fifths; white hair at sides of first segment, and segments 2 to 5 with long white hair-bands, very weak in middle of second, apical hair slightly brownish.

Indian Creek, Nampa, Idaho, at flowers of willow, April 26, 1916 (*Goldie McGlothlen*).

Easily known from *A. nigratarsis*, V. & C., and *A. brachycarpæ*, V. & C., by the dull abdomen, with the surface microscopically cancellate. It is nearest to *A. nudiscopa*, Vier., and *A. mustelicolor*, Vier., but is smaller, with reddish facial foveæ and wings not reddened. These two species have not yet been fully described, but I have specimens determined by Viereck. The hind basitarsus of *opacissima* is slender, only about half as broad as the tibia at end, a character of *nudiscopa* (syn. *angustitarsata*, Vier., *sic* Viereck in litt.) rather than *mustelicolor*. On the other hand, the dull minutely-roughened clypeus is that of *mustelicolor* rather than *nudiscopa*. The paler, dark margined stigma also distinguishes the new species from my example of *nudiscopa*.

*Andrena politissima*, sp. n.

♀.—Length a little over 9 mm.

Black, shining, the head and thorax with long pale hair, distinctly ochreous dorsally; clypeus with very long hair; facial quadrangle broader than long; process of labrum narrowly truncate; malar space short but distinct; clypeus shining, with distinct rather dense punctures, no smooth median line; facial foveæ rather broad, very pale ochreous; antennæ black, third joint little (about 4 per cent.) shorter than next two combined; mesothorax and scutellum shining, with strong scattered punctures; postscutellum prominent in middle; area of metathorax distinctly defined, dull, with a median ridge and rather weak though large oblique lateral plicæ, giving a fluted effect; tegulæ piceous. Wings dusky, greyish, yellowish basally; stigma and nervures dusky reddish; second s.m. about as broad as high, receiving first r.n. about middle. Legs black, with pale hair; middle and hind

basitarsi rather broad, with pale ochreous hair on inner side. Abdomen extremely polished, impunctate, the second and third segments depressed in middle nearly to base, the basal elevated parts weakly punctured; segments 1 to 4 without hair-bands, but 3 and 4 with pale hair at sides; fifth segment and apex with abundant pale, slightly creamy hair.

Nampa, Idaho, at flowers of willow, April 26, 1916 (*Goldie McGlothlen*).

Related to *A. cyanophila*, Ckll., but easily separated by the very feeble punctures at base of second and third abdominal segments. It seems to be close to *A. trachandrenoides*, Vier., which has never been fully described; but that has the third antennal joint longer, and on that account is excluded by Viereck from the subgenus *Trachandrena*, to which *A. politissima* certainly belongs.

# XVIII.—*The Coleoptera of the Falkland Islands.*

By G. C. CHAMPION, F.Z.S.

DR. GÜNTHER ENDERLEIN'S account of the insects of Tierra del Fuego, the Falklands, and South Georgia obtained by the Swedish South Polar Expedition, published in the 'Kungl. Svenska Vetenskapsakademiens Handlingar,' Band xlviii. no. 3, pp. 1-170, with four plates and numerous text-figures, brings our knowledge of the fauna of these regions up to 1912. His paper does not, of course, include some of the Coleoptera captured by Charles Darwin in Tierra del Fuego and the Falklands during the voyage of the 'Beagle,' which have remained for upwards of thirty years unidentified and buried, as it were, amongst the "Accessions" in the British Museum. The Falkland beetles named by the three members of the Waterhouse family (G. R., C. O., and F.), to whom the Museum is indebted for most of them, are enumerated in Enderlein's list. The remainder, supplemented by various other collections from the same islands received during recent years, including a few species obtained by Fleet-Surgeon M. Cameron in December, 1914, form the material for the present paper, which adds 11 Coleoptera to the Falkland list. The 34 (not 35, as stated) enumerated by Enderlein include 16 apterous Curculionidæ, probably all

endemic, 9 Carabidæ, the winged species of which (*Antarctica*) occur along the sea-shore and are not peculiar, 3 Tenebrionidæ, all apterous or incapable of flight, and 1 each of Dytiscidæ, Staphylinidæ, Silphidæ, Byrrhidæ, and Chrysomelidæ, the last-named requiring confirmation. One species of Carabidæ, *Metius harpaloides*, Curtis, type found by Capt. King at Sta. Elena, Patagonian coast, was incorrectly included \*, and one Curculionid, *Listroderes lemniscatus*, Quoy & Gaimard, type from the Falklands †, omitted by Enderlein, who probably followed Kolbe's Magellanic list (1907) without verifying his citations. The additions are: two families with one species each (Lathridiidæ and Pythidæ), 6 apterous Curculionidæ, 2 Staphylinidæ, and 1 Byrrhid, bringing the total to 44. Several minute Staphylinidæ, at present undetermined, were also taken by Mr. Cameron in the Islands in 1914. Darwin must have met with the Curculionid-genus *Listroderes* there, but no representative of it has been found in the Museum.

I hope to deal with various other Magellanic and Chilean Coleoptera captured by him in a separate paper. The following is a revised list of the species known from the Falklands, nearly all of which appear to have been taken on the East Island ‡:—

### Carabidæ.

#### 1. *Lissopterus quadrinotatus*, G. R. Waterh.

*Hab.* FALKLANDS (*C. Darwin*, *C. J. C. Pool*), Stanley Harbour and Port Stanley (*Enderlein*, *M. Cameron*).

Type in B.M. Enderlein names two varieties of this insect, *binotatus* and *piceus*. His figure represents an immature reddish example. There are also specimens of this species in the Museum labelled "Straits of Magellan," presented by the Lords of the Admiralty in 1869, but the locality requires confirmation.

#### 2. *Brachycælus virescens*, G. R. Waterh.

*Hab.* FALKLANDS (*Lebrun*, sec. *Rousseau*) ; TIERRA DEL FUEGO, Navarin Isl. and Hunter's Peak in Hermite Isl., near

\* Cf. Fairmaire, Ann. Soc. Ent. Fr. 1885, p. 36.

† Cf. Guérin, Rev. Zool. 1839, p. 304.

‡ The Ichneumonid described and figured by Enderlein in his Falkland paper under the name *Ophion larseni* = *O. occidentalis*, Morley (March, 1912), the latter name having a few months' priority.

Wigwam Cove, not far from Cape Horn, and Hardy Peninsula (*C. Darwin*), Orange Bay, Hoste Isl., and Cape Horn (*Hyales & Hahn*), Nose Peak (*R. Crawshaw*); S. CHILE, Punta Arenas (sec. *Fairmaire*; *R. Crawshaw*), Port Famine (*C. Darwin*).

Type in B.M.

3. *Migadops falklandicus*, G. R. Waterh.

*Hab.* FALKLANDS (*C. Darwin*).

Type in B.M.

4. *Antaretia blanda*, Dejean.

*Antaretia blanda*, Dej. Spec. Coleopt. iii. p. 529 (1828)<sup>1</sup>, and v. p. 805 (1831)<sup>2</sup>; Enderl. Kungl. Sv. Vet.-Akad. Handl. xlviii. no. 3, p. 9 (1912)<sup>3</sup>.

*Antaretia malachitica*, Dej. Spec. Coleopt. iii. p. 534<sup>4</sup>; Guérin, Voyage 'Coquille,' ii. 2, p. 59, t. i. fig. 14 (1830)<sup>5</sup>.

*Antaretia latigastrica*, Curtis, Trans. Linn. Soc. xviii. p. 194 (♀) (1839) (nec Dejean)<sup>6</sup>.

*Antaretia quadricollis*, Solier, in Gay's Hist. Chile, iv. p. 246 (1849)<sup>7</sup>.

*Hab.* FALKLANDS [Iles Malouines<sup>145</sup>] (*C. Darwin*, Col. A. M. Reid, C. J. C. Pool, M. Cameron), Port Stanley<sup>3</sup>; TIERRA DEL FUEGO (*C. Darwin*), USCLESS Bay, Nose Peak, Rio McClelland (*R. Crawshaw*); CHILE<sup>27</sup>, Valle del Lago Blanco (*Kosłowsky*), Port Famine<sup>6</sup> (*C. Darwin*, Capt. King).

There are upwards of thirty specimens of this species in the Museum—sixteen from the Falklands and the rest from various places in Tierra del Fuego or Chile. It is separable from the commoner *A. nitida*, Guér., as here interpreted, by the narrower, subquadrate prothorax, the sides of which are distinctly sinuate before the base and the hind angles subrectangular, the less parallel, posteriorly widened elytra, with their apices more produced and more deeply sinuate externally, the paler tibiae and tarsi, &c. The general coloration is much more uniform in the two sexes—green, bluish green, or obscure violaceous, no cupreous or brassy examples occurring in the series before me. The male has joints 1-3 of the anterior tarsi less dilated, and the intermediate tibiae less sinuate, than in the same sex of *A. nitida*. The antennae and legs are similarly coloured, and the prosternal process margined laterally, in the two forms. *A. annulicornis*, Curtis, type ♀, from Port Famine &c., Straits of Magellan, is a closely allied, more obscurely coloured insect. The

*Antarctia* recorded by Curtis from Port Famine under the name *A. latigastrica*, Dej., is a ♀ of *A. blanda*. Guérin's figure of the latter was taken from a specimen from Concepcion, Chile. Bates recorded in 1871 the capture of many specimens of *A. blanda* and *A. malachitica* by Capt. Macey in the Falklands. *A. racovitzai*, Rousseau, based on a single specimen (♀, to judge from his figure) from Lapataia, Beagle Canal, must come very near *A. blanda*.

### 5. *Antarctia nitida*, Guérin.

*Antarctia nitida*, Guérin, Voyage 'Coquille,' ii. 2, p. 59, t. i. fig. 10 (1830)<sup>1</sup>.

Var. *Antarctia chalybea*, Blanch. Voyage Pôle Sud, iv. p. 38, Atlas, t. iii. fig. 3 (1853)<sup>2</sup>.

*Antarctia glauca*, Blanch. loc. cit. p. 39, t. iii. fig. 4<sup>3</sup>.

? *Antarctia anodon*, Fairm. Ann. Soc. Ent. Fr. 1883, p. 485<sup>4</sup>.

*Antarctia blanda*, Enderl. Kungl. Sv. Vet.-Akad. Handl. xlviii. no. 3, p. 9, t. i. fig. 9 (? ♂ nec ♀) (1912) (part.) (nec Dejean)<sup>5</sup>.

Var. *Antarctia rimosa*, Enderl. loc. cit.<sup>6</sup>

*Hab.* FALKLANDS [Iles Malouines<sup>1</sup>], Lafonia near Port Darwin ('Challenger' Exped.: ♂), Port Stanley<sup>5 6</sup> (*Col. A. M. Reid*, *C. J. C. Pool*, *M. Cameron*: ♂ ♀); OBSERVATION ISL.<sup>5</sup>; TIERRA DEL FUEGO (*C. Darwin*: ♂), Nose Peak and Useless Bay (*R. Crawshaw*: ♂ ♀); PATAGONIA, Port Desire and Santa Cruz (*C. Darwin*: ♂); S. CHILE, Port Famine<sup>2 3</sup>, Punta Arenas<sup>4</sup> [Sandy Bay] (*J. J. Walker*, *Mus. Brit.*: ♂ ♀); Possession Bay (*Mus. Brit.*: ♂), Valle del Lago Blanco (*Kosłowsky*: ♀).

Guérin's description of *A. nitida* must have been taken from the common Falkland *Antarctia* figured by Enderlein under the name *A. blanda*, a very different insect, though they are treated as forms of one by the last-named author. The rough figure given by Guérin, however, does not show the strongly rounded sides of the prothorax, characteristic of the present species, while that of Blanchard (of *A. glauca*) agrees well in this respect. The series of about 100 examples before me, including many from Tierra del Fuego, Chile, and Patagonia, and a still larger number from the Falklands, shows great variation in colour (much as in a series of the variable *Harpalus æneus*, F., of the Palæarctic region)—æneous, cupreo-æneous (especially in ♀), green, bluish-green, or, rarely, blue or violaceous. *A. chalybea*, Blanch., from Port Famine, *A. anodon*, Fairm., from Punta Arenas, and *A. rimosa*, Enderl., from Port Stanley, are almost certainly synonymous with it. *A. rimosa* is based upon a single



example (sex not stated) with the elytral interstices somewhat convex, a form also to be found now and then amongst the specimens occurring on the mainland. The male has joints 1-3 of the anterior tarsi considerably widened, and the intermediate tibiæ curved, as well as strongly sinuate within. The basal joints of the antennæ and the tibiæ and tarsi are more or less testaceous. The third elytral interstice usually has two or three small pores along the apical half, sometimes indistinct or wanting.

This insect, according to Mr. Cameron, is common on the sea-shore at Port Stanley.

#### 6. *Dormeyeria audouini*, Guérin.

*Hab.* FALKLANDS [Iles Malouines], Soledad Bay, Port Stanley, and Hooker's Point; STRAITS OF MAGELLAN.

This Trechid and the following species, placed by Enderlein under his new genus *Dormeyeria*, are apparently not represented in the Museum.

#### 7. *Dormeyeria soledadina*, Guérin.

*Hab.* FALKLANDS [Iles Malouines], Soledad Bay, Port Stanley, and Seal Cove.

#### 8. *Trechus antarcticus*, Guérin.

*Hab.* FALKLANDS [Iles Malouines] (*C. Darwin*, *R. Vallentin*, *C. J. C. Pool*), Port Stanley (*M. Cameron*); TIERRA DEL FUEGO, Navarin Isl. (*C. Darwin*); PATAGONIA.

A long series seen, including one specimen from Navarin Island.

#### 9. *Merizodus maceyi*, Bates.

*Hab.* FALKLANDS (*C. Darwin*, *Capt. Macey*, *J. Macgillivray*, *R. Vallentin*, *C. J. C. Pool*), Port Stanley (*Col. A. M. Reid*, *M. Cameron*); TIERRA DEL FUEGO, Picton Isl., Beagle Channel (sec. *Fairmaire*), &c.

More abundant in the Falklands than *T. antarcticus*, and apparently occurring in company with it. The Museum received a long series of it in 1851 from *J. Macgillivray*.

### Dytiscidæ.

#### 10. *Lancetes flavoscutatus*, Enderlein.

*Hab.* FALKLANDS (*R. Vallentin*, *M. Cameron*), Speedwell Isl., Halfway Cove (*type*, ♀).

I have seen three males and three females of this species. It is probably a form of the variable *L. (Dytiscus) varius*, F., the fragmentary Patagonian type (♀) of which is still preserved in the Banksian Collection at the British Museum. Darwin captured a pair of the latter at Santa Cruz, Patagonia.

### Staphylinidæ.

#### 11. *Arpediomimus falklandicus*, Cameron.

*Arpediopsis falklandica*, Cameron, Ent. Monthly Mag. liii. p. 124 (June 1917).

*Arpediomimus falklandicus*, Cameron, loc. cit. p. 277 (Dec. 1917).

*Hab.* FALKLANDS, Port Stanley (*M. Cameron*).

Found in decaying kelp (*Macrocystis pyrifera*) in Dec. 1914. This genus is placed by its describer in a new group, "*Arpediomini*." The generic name first used was found to be preoccupied in Staphylinidæ.

#### 12. *Quedius mexomelinus*, Marsham.

*Hab.* FALKLANDS (*R. Vallentin*).

A cosmopolitan insect. One specimen only taken. It has been recorded from Australia, New Zealand, Peru, &c.

#### 13. *Antarctophytosus darwini*, F. Waterh.

*Phytosus darwini*, F. Waterh. Journ. Linn. Soc., Zool. xiv. p. 531 (1878).

*Paraphytosus atriceps*, Cameron, Ent. Monthly Mag. liii. p. 125 (June 1917) (nec Waterh.).

*Antarctophytosus darwini*, Cameron, loc. cit. p. 233 (Oct. 1917).

*Hab.* FALKLANDS (*C. Darwin*) ; CROZET IS.

Found by Mr. Cameron on sandy beaches in the Falklands in dry root-masses of "kelp" in Dec. 1914. Included in Enderlein's list under the name *Phytosus darwini*.

Type in B.M.

### Silphidæ.

#### 14. *Catops falklandicus*, F. Waterh.

*Hab.* FALKLANDS (*C. Darwin*), Port Stanley (*M. Cameron*); TIERRA DEL FUEGO, Rio McClelland, San Sebastian (*R. Crawshay*), Gable Isl.

Three specimens (♂ ♂ ♀) of this species were captured by Mr. Cameron at Port Stanley.

Type in B.M.

### Byrrhidæ.

#### 15. *Chalciosphærium solow*, Enderlein.

*Hab.* FALKLANDS, Port Louis.

Type captured on July 25th, 1902. Not represented in B.M.

#### 16. *Chalciosphærium enderleini*, sp. n.

Oval, very convex, shining, æneous or greenish-æneous above, æneo-piceous beneath, the antennæ and legs in great part piceous; somewhat thickly clothed with long, erect, bristly, brownish hairs (all easily abraded), the under surface and legs also pubescent; the head and prothorax rather closely and conspicuously, the elytra more sparsely and irregularly, punctate; beneath very closely, the metasternum more sparsely, punctured, the concave pro- and epipleura much smoother. Head large, broad; antennæ rapidly widening outwards, joints 6–10 strongly transverse, 11 ovate, about as long as 9 and 10 united, 7–11 forming an elongate, lax club. Prothorax rapidly narrowing from the base forward, the sides (viewed laterally) almost straight, the hind angles sharp. Scutellum wanting. Elytra moderately long, rapidly, arcuately narrowing from the base, somewhat acuminate at the tip. Prosternal process broad, rounded at the apex, which is received in a smooth deep cavity in the mesosternum. Tarsi with a narrow pencil of hairs at the apex of the third joint beneath, the fourth joint very small. Ædeagus: lateral lobes very long and acuminate, the long penis-sheath also acuminate and curved downward at the tip.

Length  $2\frac{1}{2}$ –3, breadth  $1\frac{1}{2}$ – $1\frac{2}{3}$  mm.

*Hab.* FALKLAND IS. (*Th. Havers*), Port Stanley [type, ♂] (*M. Cameron*).

Described from a perfect male captured by Mr. Cameron in Dec. 1914. Two others, imperfect and abraded (♀ ♀?), found in the Falklands in 1860, and presented by Mr. Havers to the British Museum in 1873, seem to belong to the same species. The unique type of the genus, *C. solow*, is a larger and broader insect (length  $3\frac{3}{4}$ , breadth  $2\frac{1}{4}$  mm.), and much more rounded at the sides (to judge from Enderlein's figure), and it has a long lobe or spiniform process at the apex of the

third tarsal joint beneath. *C. enderleini* agrees with *C. solow* in having no visible scutellum, both doubtless being apterous. The present insect has the general facies of a *Simplocaria*, except that the elytra are without trace of striæ.

### Lathridiidae.

#### 17. *Lathridius malouinensis*, sp. n.

Elongate, somewhat depressed, moderately shining, the head and prothorax ferruginous, the elytra testaceous, obliquely nigro-bifasciate (the fasciæ varying in development, sometimes more or less coalescent and leaving only the apex and a humeral patch testaceous), the antennæ (the club excepted) and legs testaceous, the terminal joint of the tarsi more or less infusate, the under surface in great part piceous. Head densely, rather coarsely punctate, grooved down the middle and also towards the sides, the eyes small, rounded, the temples about equalling them in length; antennal club 3-jointed, the terminal joint obliquely truncate at the tip. Prothorax much longer than broad, strongly explanate at the sides anteriorly, deeply constricted and transversely grooved before the base, the caducous membranous margin broad; the surface roughly punctate, bicostate on the disc (appearing deeply sulcate down the middle). Elytra long, oval, somewhat acuminate at the tip, extending well beyond the abdomen, the humeri not prominent; with rows of closely placed coarse punctures, the interstices narrow, 3 and 5, and also 7 at the base, costate.

Length  $1\frac{3}{4}$ –2 mm.

*Hab.* FALKLAND IS., Port Stanley (*M. Cameron*).

Numerous examples, found on the flowers of an introduced *Ulex*, on Dec. 9th, 1914. This species belongs to the section *Coninomus*, Thoms. It is much more depressed than the somewhat similarly coloured *L. bifasciatus*, Reitt. (= *nigromaculatus*, Blackb.), from Australia, and has more even, relatively longer, oval elytra. Reitter and Belon have described various allied forms from Chile, but the Falkland insect does not accord with any of them. This *Lathridius* may have been introduced into the islands with the plant upon which it was found. Some of them, like *L. nodifer*, Westw. (= *antipedum*, White), are cosmopolitan. The genus is not included in Enderlein's list, 1912.

**Tenebrionidæ.**

18. *Darwinella amaroides*, Enderlein.

*Hab.* FALKLANDS (*R. Vallentin*), Fox Bay.

Enderlein records the capture of seven specimens at Fox Bay in March 1902. There is an example of it in the Museum. A monotypic genus.

19. *Parahelops quadricollis*, C. O. Waterh.

*Hab.* FALKLANDS (*C. Darwin*, *Col. A. M. Reid*, *C. J. C. Pool*), Port Stanley (*M. Cameron*), Cannila Creek, Port Darwin, Goose Green, Seal Cove, Port Louis; TIERRA DEL FUEGO, Hardy Peninsula (*C. Darwin*).

There is a long series of this species from the Falklands in the Museum, and two specimens from the Hardy Peninsula.

Type in B.M. An addition to Enderlein's Fuegian list.

20. *Parahelops haversi*, C. O. Waterh.

*Hab.* FALKLANDS (*Th. Havers*), Fox Bay.

Apparently a much rarer insect than *P. quadricollis*, represented in the Museum by two specimens only, including the type.

**Pythidæ.**

21. *Poophylax falklandica*, Champ.

*Poophylax falklandica*, Champ. Ann. & Mag. Nat. Hist. (8) xvii. pp. 311, 312 (April 1916).

*Hab.* FALKLANDS (*H. N. Sullivan*).

Found in numbers (dead), in 1915, in seeds of tussac-grass, *Poa flabellata*, sent from the Islands for the purpose of attempting to introduce the plant into Scotland.

Type in B.M.

**Chrysomelidæ.**

22. *Luperus marginalis*, Allard.

*Hab.* FALKLANDS.

The type of this Galerucid was received from M. Pipitz of Graz. The locality seems to require confirmation.

## Curculionidæ.

23. *Hypera bidentata*, sp. n.

Oval, convex, fusco-testaceous; the prothorax and elytra variegated with a dense clothing of rounded, whitish, ochraceous, and dark brown adpressed scales—the darker scales on the elytra condensed into an oblique mark on the disc of each before the middle, the ochraceous scales on the prothorax (oval on the disc) forming a large dorsal patch, interrupted by a faint whitish median line, and those on the elytra mainly placed on the dorsum and suture, and almost enclosing a rather large oblique postmedian whitish patch—intermixed with erect pallid scattered setæ, which are uniseriately arranged down each of the elytral interstices; the head, flanks of elytra, and under surface with hair-like pallid scales, the antennæ and legs with bristly hairs; the entire surface densely, finely punctate. Head flattened between the eyes; rostrum very stout, short, straight, not carinate; antennæ rather short, joints 5–7 of funiculus transverse, the scape reaching to the posterior margin of the eyes. Prothorax broader than long, rounded at the sides, a little wider at base than at apex. Elytra oval, acuminate at tip, flattened on the disc anteriorly, finely punctato-striate, the fifth interstice with a large conical tubercle at its point of termination. Metathoracic episterna narrow. Legs long, comparatively slender.

Length (excl. head)  $5\frac{1}{4}$ , breadth  $2\frac{1}{2}$  mm.

*Hab.* FALKLANDS, East Island (*Col. A. M. Reid*, Nov. 1908–Feb. 1909).

One specimen, slightly immature, with the vestiture in perfect condition. This insect is provisionally referred to *Hypera*, and may have to be removed from it when more material is available for examination. The genus *Hypera* (*Phytonomus*) is not included in Kolbe's Magellanic list, but one or two forms have been recorded from Argentina and Chile. The presence of conical tubercles on the elytra and the rather large scales on the upper surface (which completely hide the sculpture) are characters foreign to the genus *Hypera*. The prothorax is without ocular lobes, and the species cannot therefore be placed under *Listroderes*.

24. *Listroderes lemniscatus*, Quoy et Gaimard.

*Curculio lemniscatus*, Quoy et Gaim. Voyage 'Uranie,' Zool. p. 549, t. lxxxii. fig. 4 (1824)<sup>1</sup>.

*Cylydrorhinus lemniscatus*, Guérin, Voyage 'Coquille,' ii. 2, p. 119 (1830)<sup>2</sup>; Rev. Zool. 1839, p. 304<sup>3</sup>.

*Cylydrorhinus* [*lemniscatus*], Guérin, Rev. Zool. 1839, p. 374<sup>4</sup>.

*Hab.* FALKLANDS [Malouines<sup>5</sup>], Baie de Chiens Marins<sup>1</sup> [Sea Dog's Bay] (*Quoy et Gaimard*).

This insect, the type of *Cylydrorhinus*, Guér., must be very like the one from Port Famine figured by Blanchard in 1853 under the name *C. lineatus*, differing from it in the more rounded sides of the prothorax and the narrowly albolineate elytra. Guérin<sup>3</sup> gave the correct locality for it in 1839, a fact overlooked by subsequent writers. In the enlarged Falkland map of the "Voyage of the 'Beagle'" there is shown a "Sea Dog Island" in W. Falkland, and the Bay of that name is doubtless not far distant.

25. *Listroderes biangulatus*, sp. n.

Elongate, broad, robust, shining; nigro-piceous, the tarsi, tibiae, and antennae sometimes reddish; above densely clothed with narrow, sericeous, adpressed, hair-like scales, which are bronze-brown on the greater part of the surface, the head and prothorax along the sides, the scutellum, and the suture, a submarginal stripe, and the inferior margin of the elytra, and sometimes several scattered spots on the disc of the latter, with similar whitish or brownish-white scales, the vestiture of the under surface sparser and paler; the ventral segments 1-4 with a transverse pallid patch on each side; the upper surface densely, finely, rugulose, the under surface a little more sparsely, punctate. Rostrum very stout, short, widened outwards, sharply carinate down the middle, and obliquely sulcate on each side of this in front of the feeble basal constriction, the scrobes limited above by a prominent ridge. Antennae with joints 2-7 of the funiculus rapidly diminishing in length, 5-7 strongly transverse. Prothorax broad, short, uneven, biangularly explanate at the sides, constricted at the base. Elytra long, regularly convex, oval, deeply punctato-striate, the interstices equal in width, more or less arched, the apices sometimes obsoletely mucronate. Ventral segment 1 excavate in the middle in ♂.

Length 13-14 (excl. head), breadth  $6\frac{1}{4}$ -7 mm. (♂ ♀.)

*Hab.* FALKLANDS (*Th. Havers, Col. A. M. Reid, C. J. C. Pool*), Port Stanley (*R. Vallentin*).

Seven specimens. This is another species resembling the insect from Port Famine figured by Blanchard under the name *Cylydrorhinus lineatus*\*, differing from it in the finely punctate prothorax, with the sides more strongly explanate and biangulate, the much finer seriate punctures on the elytra, and the sides, inferior margin, and suture only of the latter (instead of the alternate interstices) albo-lineate. *C. tessellatus*, Guér., from Port Famine and Punta Arenas, is another allied form, with the margins of the prothorax less angulate, and the seriate punctures on the elytra coarser and less approximate, than in the present species. The type of the genus *Cylydrorhinus*, *C. lemniscatus*, has the sides of the prothorax rounded, and the lateral expansion cannot therefore be used as a character by which to separate it from *Listroderes*, as has been done by Lacordaire. According to a label attached to the specimen of *L. biangulatus* received from Mr. Rupert Vallentin in 1899, this insect is known in the Falklands as the "Peat-beetle of the Malvinas."

## 26. *Listroderes bicaudatus*, Enderlein.

*Hab.* FALKLANDS (*W. E. Wright, Th. Havers, R. Vallentin, C. J. C. Pool*), Port Stanley (*Col. A. M. Reid*), Port Darwin, Goose Green (*Enderlein*).

The fourteen examples of this species before me, including one received by the Museum in 1842, show considerable variation in the elytral markings, some of them having a distinct sutural stripe, and a narrower line down the third and fifth interstices, in addition to various scattered spots, of greyish hair-like scales, such specimens nearly agreeing with the figure of *L. (C.) lemniscatus*, one only being spotted and non-lineate as shown in Enderlein's plate. The prothorax is almost rounded at the sides in one example, subangulate in others. The elytra are long, convex, oval, rather coarsely, conspicuously, punctato-striate, with the interstices 3 and 5 more or less raised and a little narrower than the others; the apices are produced into a stouter and blunter tooth in the ♀ than in the ♂, as is often the case in this genus. The first ventral segment is excavate down the middle in ♂.

\* Renamed *C. confuseanus* by Berg in 1899.



27. *Listroderes compressiventris*, Enderlein.

*Hab.* FALKLANDS (*Th. Havers*, *R. Vallentin*), Seal Cove and Port Louis (*Enderlein*), Port Stanley (*Col. A. M. Reid*, *M. Cameron*).

Described from three examples. The thirteen others in the British Museum are mostly in poor condition, few of them showing the pallid oblique streak on the sides of the elytra towards the apex which is indicated in Enderlein's figure. Recognizable amongst its allies by the apically compressed, subacuminate, convex, elongate elytra, which, viewed in profile, appear abruptly declivous at the apex, this being due to the thickening of the suture before the tip. The male has the first ventral segment deeply excavate down the middle. There is an indication of a smooth median line on the prothorax in all the specimens before me, including three males.

28. *Listroderes nordenskiöldi*, Enderlein.

*Hab.* FALKLANDS, Port Darwin, Seal Cove, and Port Stanley (*Enderlein*), W. Falkland (*R. Vallentin*).

Described from nine examples, presumably all males. Two females before me seem to belong to this species, these having the prothorax and under surface densely, finely punctate, almost granulate, and the squamosity of the elytra variegated with irregular rows of whitish spots, the cinereous hairs on the under surface long and adpressed. The apices of the elytra are not produced.

29. *Listroderes griseonotatus*, sp. n.

♂. Elongate, moderately convex, dull above, shining beneath, nigro-piceous, the antennæ, tarsi, and tips of the femora ferruginous; sparsely, finely griseo-pubescent, the pubescence becoming closer at the sides of the elytra and clustered into oblong spots on their disc, and also condensed into a faint sinuous submarginal line on the prothorax; above densely, finely, shallowly, beneath very sparsely, punctate. Rostrum short, stout, a little widened outwards, rugosely, confluent punctate, with a sharp median carina and an indication of another one on each side exterior to this. Head foveate and somewhat depressed between the eyes, the antennal scape reaching to a little beyond them, the vertex simply punctate. Prothorax transverse, rounded at the sides, widest before the

middle, narrowed behind. Elytra long, oval, broadly produced at the tip, the apices each with a small dentiform projection above the obtuse apical angle; somewhat flattened on the disc, and uneven towards the sides and tip, with rows of rather large shallow punctures, the interstices 3 and 5 towards the apex, and 7 for the greater part of its length, convex or subcostate. Ventral segments 1 and 2 deeply excavate in the middle.

Length (excl. head) 9, breadth 4 mm.

*Hab.* FALKLANDS (*W. E. Wright*).

One specimen, received by the Museum in 1842. Very like *L. nordenskiöldi*, Enderl., and with similarly griseo-maculate elytra (except that the small spots on the disc are less numerous and more elongate), differing from that insect in its more depressed form, the very sparsely punctate shining under surface, the less densely punctate, smoother prothorax, and the wholly ferruginous antennæ and tarsi. The rudimentary wings are barely 2 mm. in length.

### 30. *Listroderes bracteatus*, Enderlein.

*Hab.* FALKLANDS (*Th. Havers & R. Vallentin*, in *Mus. Brit.*; *Mus. Oxon.*), Port Stanley (*Enderlein*, *Col. A. M. Reid*, *M. Cameron*).

Described from two examples captured on Feb. 22nd, 1902. There are a dozen specimens of it in the British Museum and two abraded individuals in the Oxford Museum. *L. bracteatus* has the general facies of a large elongate *Hypera*. It is thickly clothed above with small yellowish-brown scales, with scattered, short, bristly hairs intermixed, these latter being decumbent on the prothorax, and semi-erect and seriatly arranged on the elytra. The prothorax has a conspicuous line of opalescent or metallic scales down the centre and an angulate pallid line towards the outer margin. In two of the specimens before me the small pallid oblique streak on the third elytral interstice beyond the middle is extended outwards, forming with the one on the opposite wing-case a common V-shaped mark, much as in *L. falklandicus*, Enderl., to judge by the figure given by the author. The male has the first ventral segment moderately excavate in the middle.

### 31. *Listroderes gibber*, Enderlein.

*Hab.* FALKLANDS (*Mus. Brit.*), Port William, Sparrow Cove (*Enderlein*).

Described from a single example (?♀) captured on March 2nd, 1902. A ♀, ex coll. Pascoe, with a conspicuous, dentiform projection at the apex of each elytron, and the alternate interstices raised, a sharply 5-carinate rostrum, and the body finely pubescent, dull above and very shining beneath, seems to be referable to *L. gibber*. Two males in the Museum, smaller, narrower, and with the apices of the elytra unarmed, will probably prove to belong to the same species.

32. *Listroderes divaricatus*, Enderlein.

*Hab.* FALKLANDS, Seal Cove.

Described from a single example, taken on March 13th, 1902. Not represented in B.M.

33. *Listroderes vulsus*, Enderlein.

*Hab.* FALKLANDS, Port Darwin, Goose Green.

Described from three examples, taken on March 6th, 1902. Not represented in B.M.

34. *Listroderes falklandicus*, Enderlein.

*Hab.* FALKLANDS, Hooker's Point, Port William, Seal Cove, Port Stanley.

Not recognized amongst the material before me. Apparently very like *L. bracteatus*, but with hair-like vestiture instead of rounded scales.

35. *Listroderes abditus*, Enderlein.

*Hab.* FALKLANDS, Fox Bay.

Described from four examples, found in March 1902. A smaller form than any of its allies in the same islands. Not represented in B.M.

36. *Listroderes salebrosus*, Enderlein.

? *Listroderes salebrosus*, Enderl. Kungl. Sv. Vet.-Akad. Handl. xlviii. no. 3, p. 20, t. ii. fig. 18<sup>1</sup>.

♂. Elongate, rather narrow, opaque above, shining beneath, varying in colour (according to maturity) from nigro-piceous to reddish-brown, the elytra sometimes obscurely rufescent with blackish markings, finely pubescent; above densely, finely, rugulosely, the elytra very shallowly, punctate; beneath

sparsely, finely, the flanks of the prothorax coarsely, punctate. Rostrum short, stout, widened outwards, feebly or obsoletely 5-carinate. Head foveate in the middle between the eyes. Antennæ with joints 3-7 of the funiculus short, 1 and 2 elongate. Prothorax transverse, rounded or feebly sinuate or subangulate at the sides, narrowed behind, uneven, the two depressions on the anterior portion of the disc separated by a raised median line. Elytra elongate, gradually narrowing from about the middle, and broadly produced at the apex, the apices conjointly rounded; with series of coarse shallow punctures placed in shallow striæ, the interstices somewhat convex; each elytron with two oblique ridges on the disc beyond the middle (extending from the fifth interstice to near the suture, the anterior one inconspicuous or evanescent, the subapical one sharply raised and terminating in a prominent tubercle on the interstices 2 and 5), and a large subtriangular tubercle before the tip. Ventral segment 1 with a broad, deep, transversely rugose excavation in the middle. Tibiæ strongly sinuate within.

♀. Broader; the elytra more rounded at the sides, with the subapical tubercles larger and longer, the inner one on the second oblique ridge produced into a long spiniform process on each side of the suture, the apices distinctly caudate. Tibiæ less sinuate within.

Length (excl. head) 7-10, breadth  $3-4\frac{1}{10}$  mm. (♂ ♀.)

*Hab.* FALKLANDS (*Th. Havers, R. Vallentin, C. J. C. Pool*), Port Stanley<sup>1</sup> (*Col. A. M. Reid*), Hooker's Point<sup>1</sup>, Port Darwin<sup>1</sup>, Seal Cove<sup>1</sup>.

Enderlein apparently did not know the ♀ of this species, if it has been correctly identified by me. His figure (♂) is apparently inaccurate, and the insect is here redescribed from a series of twenty examples—eleven males and nine females. The sexual difference in the development of the elytral tubercles is remarkable, these being longer and larger in ♀ than in ♂: a somewhat similar peculiarity has been observed in the Patagonian genus *Sysciophthalmus*, Heller (1906). *L. (Elytrogonus) varicosus*, Blanch., from Port Famine, to judge from the figure, may be an allied form\*.

### 37. *Reichertia exsculpticollis*, Enderlein.

*Hab.* FALKLANDS (*Th. Havers, R. Vallentin*), Port Darwin (*Enderlein*), Port Stanley (*Enderlein, Col. A. M. Reid*).

\* The type of *E. varicosus* is stated to have been accidentally destroyed by the artist employed by Blanchard.

The seventeen specimens of this insect before me, including several males, exhibit considerable variation in the elytral markings: three only ( $\sigma$   $\sigma$ ) have an interrupted submarginal stripe of pallid scales (a character used by Enderlein in his table of the species); others have small scattered patches of pallid scales along the rows of punctures; others, dirtier, have the vestiture uniformly dark brown. The oblique dilatation of the elytral humeri is more pronounced in the  $\sigma$  than in the  $\text{f}$ . The penis-sheath is broad and acuminate, and the first ventral segment transversely hollowed anteriorly, in  $\sigma$ . The eight examples received by the Museum from Mr. Havers in 1873 were captured in 1860. A specimen ( $\sigma$ ) in the same collection, from that of Bowering, is labelled "Am. bor. Dupont," obviously in error, as the insect is precisely like those from the Falklands.

38. *Reichertia insquamea*, Enderlein.

*Hab.* FALKLANDS, Fox Bay.

Described from two specimens found in March 1902. These seem to be partially abraded females of *R. exsculpticollis*, the sexes of which were not identified by Enderlein.

39. *Reichertia scabra*, Enderlein.

*Hab.* FALKLANDS (*Th. Havers, Col. A. M. Reid, C. J. C. Pool*), Port Stanley (*Enderlein, M. Cameron*), Port Darwin, Seal Cove (*Enderlein*).

About a dozen examples before me seem to belong to this species. They are considerably smaller than *R. exsculpticollis* (length  $4\frac{1}{2}$ – $6\frac{1}{2}$  mm., exclusive of head), and have the anterior margin of the prothorax a little straighter, and the oblique humeral dilatation of the elytra less prominent, at least in  $\sigma$ . Clean specimens show numerous small subquadrate patches of pallid scales on the elytra, giving a mottled appearance to their surface. The tuberculiform elevations towards the apex tend to become longitudinally confluent in most of them. Enderlein's figure is unsatisfactory, if the insect has been correctly identified by me.

40. *Falklandius brachyomma*, Enderlein.

*Hab.* FALKLANDS, Port Stanley (*Enderlein, M. Cameron*).

Described from two examples captured in 1902. Seven males and two females were taken by Mr. Cameron at the

same locality in 1914. The male has the first ventral segment very broadly and deeply excavate down the middle. Two of the species of this genus have the general facies of *Exomias*.

41. *Falklandius turbificatus*, Enderlein.

*Hab.* FALKLANDS (*C. Darwin, Th. Havers*). Port William, Sparrow Cove (*Enderlein*).

There are five specimens of this species in the Museum, including four captured by Darwin.

42. *Falklandius suffodens*, Enderlein.

*Hab.* FALKLANDS, near Hooker's Point.

Not represented in the collections before me.

43. *Falklandius inæqualis*, sp. n.

Oblong-obovate, piceous or reddish brown, the antennæ and legs paler; variegated above with a dense clothing of small brownish and white, imbricate scales—the white scales condensed in one specimen into a faint submarginal line on the prothorax and various small patches on the elytra—intermixed with numerous short semierect setæ, the under surface finely pubescent; the entire surface densely, very finely punctate, the prothorax with rather coarse punctures intermixed, the seriate punctures on the elytra also coarse. Rostrum very stout, short, widened outwards, without groove or carina above. Eyes rather large, transverse, depressed. Antennæ with joint 1 of funiculus about as long as 2–4 united, 4–7 transverse, the scape reaching the posterior margin of the eyes. Prothorax about as long as broad, somewhat produced in the middle anteriorly, feebly rounded at the sides, distinctly compressed towards the apex, uneven on the disc, and obsoletely, interruptedly carinate down the middle. Elytra oblong-oval, much wider than the prothorax, the striæ slightly sinuate, the alternate interstices interruptedly costate, the others somewhat convex. Legs stout, the tibiæ strongly sinuate within. Prosternum broadly arcuato-emarginate in front.

Length (excl. head) 3, breadth  $1\frac{2}{3}$ – $1\frac{3}{5}$  mm. (♂ ♀.)

*Hab.* FALKLANDS, Port Stanley (*Col. A. M. Reid, M. Cameron*).

Three examples, the one found by Mr. Cameron slightly

immature and showing the sculpture and variegated vestiture much better than the two others captured some years previously by Colonel Reid. This insect has the structural characters of *F. brachyomma* and *turbificatus*, Enderl., but it is very different from them in general appearance, resembling a *Cænopsis* or *Trachyphlæus*. It is just possible that the three specimens before me are referable to *F. suffodens*, Enderl., the type of which was from Hooker's Point; but as the author says nothing about the uneven subcarinate prothorax, &c., and the Port Stanley insect is very different from his figure, it must be treated as distinct.

#### HAVERSLIA, gen. nov.

Rostrum strongly curved, stout, thickened at the base, about reaching the posterior margin of the anterior coxæ, the scrobes lateral, deep, extending from the middle to the eyes; antennæ with a 7-jointed funiculus, 2-7 short, the club acuminate-ovate, with distinct sutures, the scape reaching the eyes; head rather small, convex; eyes transverse; prothorax without ocular lobes, truncate at base; scutellum triangular, covered by the elytra; elytra elongate, acuminate at tip, obliquely cut off at base, the humeri obtuse; anterior and intermediate coxæ contiguous; posterior coxæ separated by the long abdominal process; metasternum short, not so long as the lateral portions of ventral segment 1, the episterna narrow; mesothoracic epimera small, narrow, not ascending; ventral segments 1 and 2 equal in length laterally, connate at middle, 3 and 4 short, together barely as long as 2, the first suture sinuous, the others straight; legs short, stout, the femora much thickened, the tibiæ subangulate at apex externally; tarsi broad, joints 1-3 spongy-pubescent beneath, 1 and 2 transverse, 3 strongly bilobed, the claws small, stout, free; body elongate, densely clothed with shining scales, apterous.

Type, *H. albolimbata*.

The insect taken as the type of this genus has the general facies of a small *Lixus*. It is probably best placed near the subaquatic American genus *Endalus*, Lec., and it may have similar habits. The elytra are more acuminate and the tarsi broader than in the Palæarctic genus *Mecinus*. For the present *Haversia* must be referred to the "Erirrhinides." The species may have been introduced in some way into the Falklands, but this is hardly likely to be the case.

44. *Haversia albolimbata*, sp. n.

Elongate, convex, narrow, acuminate posteriorly, shining, black, the antennæ and tarsi rufescent; above densely clothed with shining, adpressed scales, which are coppery-brown in colour, except along the sides of the prothorax and elytra, around the eyes, on a median line on the prothorax, and on the hidden scutellum, where they are wholly whitish, the scales on the under surface smaller, whitish, those on the upper surface of the femora cupreous; densely, finely punctate, above and beneath. Rostrum densely punctate, substriate, and squamose at the base, bare and almost smooth thence to the tip. Prothorax a little broader than long, rounded at the sides, narrowed in front and behind, margined at the base. Elytra a little wider than the prothorax, parallel to near the middle, and rapidly narrowed thence to the apex, margined at the base, feebly punctato-striate, the interstices flat. Ventral segments 1 and 2 sulcate down the middle.

Length (excl. head)  $3\frac{3}{4}$ , breadth  $1\frac{1}{2}$  mm. (♂.)

*Hab.* FALKLANDS (*Th. Havers*).

Two specimens received by the Museum in 1873, both injured by pinning, one with the vestiture intact. The scales on the upper surface are so closely placed as to completely hide the sculpture, as in various species of somewhat similarly coloured *Tychius* and *Sibinia*.

Horsell, Dec. 1917.

XIX.—*On small Mammals from Salta and Jujuy collected by Mr. E. Budin.* By OLDFIELD THOMAS.

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THE British Museum has recently received a collection of Mammals made in Salta and Jujuy by Mr. E. Budin, to whom we were indebted for those from Jujuy described in 1913\*. This further collection contains so many species of interest that a list of it seems worthy of publication.

The specimens come from two distinct localities—one, Manuel Elordi, comparatively lowland (500 m.), on the western Chaco country of the Upper Vermejo, and the other, Leon, on the hill-country to the north-west of Jujuy town, at an altitude of 1500 metres. The animals obtained

\* Ann. & Mag. Nat. Hist. (8) xi. p. 136 (1913).



at this latter place, like the previous Jujuy collection, all show a strong relationship to the species of the middle highlands of Bolivia, 500 miles further northwards, first made known through the efforts of Mr. Perry O. Simons.

The most interesting forms in the collection are the little hare of the Vermejo, *Sylvilagus b. gibsoni*, the first occurrence of the Leporidae in Argentina, and the new genus *Hypsimys*, *Akodon*-like in general appearance but differing from all members of the *Akodon* group by its extreme hypsodontism.

1. *Molossus rufus*, Geoff.

♀. 8. Manuel Elordi, Vermejo, 500 m.

Quite like Paraguayan specimens representing *M. castaneus*, but whether that is quite the same as the Cayenne *M. rufus* I am somewhat doubtful. Several specimens of the latter obtained by Mr. Cherrie are among the blackest of the group.

2. *Oryzomys* sp.

♂. 4; ♀. 2, 3, 6. Manuel Elordi, Upper Vermejo.

3. *Oryzomys* sp.

♂. 13, 14, 32, 34, 45; ♀. 9, 10, 27, 28, 41, 44. Leon, Jujuy, 1500 m.

These two species of *Oryzomys* are both of the difficult *flavescens* group; the Jujuy one is the larger of the two.

4. *Phyllotis darwini tucumanus*, Thos.

♂. 12, 16, 23, 36; ♀. 15, 17, 18, 19, 20, 24, 29, 30, 35. Leon, Jujuy.

5. *Graomys lockwoodi*, sp. n.

♂. 5. Manuel Elordi, Vermejo, Salta, alt. 500 m. 7th August, 1917. B.M. no. 18.1.1.6. Type.

Most nearly resembling the Bolivian *G. domorum*, with which it agrees in size (though its feet are longer), general colour, and the slaty bases to the hairs on the chest and belly; those of the chin and throat only being white to their bases. Tail sharply bicolor, blackish above, white below, not so heavily haired as in the type of *G. cachinus*.

Skull of about the same size as in *G. domorum* and *cachinus*, but its bullae larger than in the former, smaller than in the latter.

Incisors turned backwards towards the throat more than

usual, the index being only  $56^{\circ}$ . *Graomys* is always opisthodont, but usually has the index about  $60^{\circ}$ – $65^{\circ}$ , so that this species, if the character proves to be constant, is the most marked of all in this respect.

Dimensions of the type (measured in the flesh) :—

Head and body 131 mm.; tail 158; hind foot 32; ear 25.

Skull: greatest length 35; condylo-incisive length 31.7; zygomatic breadth 18; nasals 14.7; breadth of brain-case 15; palatilar length 1.57; palatal foramina 7.3; bullæ  $6.7 \times 5.5$ ; upper molar series 5.4.

*Hab.* and *Type* as above.

In its longer foot and larger bullæ, as compared with *G. domorum*, this western Chaco species shows two of the usual modifications induced by desert conditions. *G. cachinus* and *chacoensis* have still larger bullæ, and the latter has a pure white under surface.

Named in honour of Mr. Charles Lockwood, of Buenos Ayres, by whose kindness as intermediary all the business arrangements with Messrs. Kemp and Budin have been so greatly facilitated.

I notice that Mr. Osgood would amalgamate *Graomys* with *Phyllotis*, or at least consider it only as a subgenus. But the convenience of having a special generic name for so definite a group appears to me to make its retention advisable. The characteristic supraorbital ridges, which are never found in *Phyllotis*, are clearly marked even in half-grown specimens of *Graomys*.

#### 6. *Oxymycterus paramensis*, Thos.\*

♂. 31, 42, 46, 52. Leon, Jujuy, 1500 m.

These Hociudos appear to agree with the typical series of *O. paramensis*, from the highlands near Cochabamba, in every detail, and thus afford a striking instance of the community of the faunas of the two regions concerned.

#### 7. *Akodon lactens*, sp. n.

♀. 37. Leon, Jujuy, 1500 m. 23rd August, 1917. B.M. no. 18.1.1.37. *Type*.

Externally approaching *A. varius* and *simulator*, but skull more as in *A. obscurus*.

\* A misprint in the original description (Ann. & Mag. Nat. Hist. (7) ix. p. 139, 1902) may be here corrected :—

In line 8 of description, for "black, lined" read "black-lined."

Size about as in *varius*. General colour above mixed blackish and buffy, the resulting combination near "buffy brown," the lining rather well marked, the head greyer, the rump more buffy. Sides and belly distinctly more buffy, the ends of the hairs on lower sides and below strong cinnamon-buff; the chin and interramia prominently contrasted white. Ears about the colour of the head. Claws rather long, especially anteriorly, as usual in the *obscurus* group, the front claw both in front and behind 4 mm. in length, the posterior therefore not exceeding the anterior.

Skull on the whole very like that of *A. obscurus*, of the same stout heavy build, with squared but not ridged inter-orbital region, and minute interparietal. Palatal foramina long, reaching to the level of the second lamina of *m*<sup>1</sup>.

Incisors even more proodont\* than in *A. obscurus*, their angle with the tooth-row 95° in the type, specimens of *obscurus* ranging from 85° to 92°. Their front surface in the type unusually light coloured, pale yellow, lightening to white at the tips. Molars as in *A. obscurus*.

Dimensions of the type (measured in the flesh) :—

Head and body 101 mm. ; tail 67 ; hind foot 22 ; ear 16.

Skull : greatest length 27·2 ; condylo-incisive length 27 ; greatest breadth 15·5 ; nasals 9 ; interorbital breadth 5 ; breadth of brain-case 12·3 ; palatilar length 13 ; palatal foramina 6·6 ; upper molar series 5.

*Hab.* and *Type* as above.

This is a very well marked species, differing widely in colour from the other members of the *A. obscurus* group, to which the characters of its skull seem to ally it. In external appearance it is not unlike *A. varius* and *simulator*, apart from the prominent buffy colour of its lower surface. Its contrasted white chin is just as in *simulator*.

#### 8. *Akodon puer canosus*, subsp. n.

♂. 22 ; ♀. 21, 33. Leon, Jujuy, 1500 m.

Agreeing with true *A. puer* in general characters and in the remarkably small size of the teeth, but the colour is darker and duller, less suffused with buffy or tawny. Dorsal surface dark olivaceous, near "brownish olive"; sides but little more buffy. Under surface not sharply defined, terminal half of hairs dull "pinkish buff."

\* Cf. Ann. & Mag. Nat. Hist. (9) i. p. 35 (footnote) (Jan. 1918).

Skull apparently quite as in *puer*.

Dimensions of the type (measured in the flesh) :—

Head and body 82 mm.; tail 72; hind foot 20; ear 16.

Skull: tip of nasals to back of interparietal 18; zygomatic breadth 11·3; nasals 9; interorbital breadth 4·6; palatilar length 10·2; palatal foramina 6; upper molar series 3·6; breadth of  $m^1$  1·0.

*Hab.* as above.

*Type.* Adult male. B.M. no. 18. 1. 1. 38. Original number 22. Collected 21st August, 1917.

This *Akodon* seems alone related to *A. puer*, the remarkably small size of the molars separating the two from any other species known to me. In colour, as usual, the Jujuy form is darker and less bright than that of the dry Bolivian highlands.

### 9. *Hypsimys budini*, gen. et sp. nn.

♂. 38, 39, 40, 47, 48; ♀. 43. Leon, Jujuy, 1500 m.

### HYPSIMYS, gen. n.

External characters quite as in *Akodon*, but claws longer, the anterior as long as or longer than the posterior.

Skull in general form rather narrower than in *Akodon*, but not of the excessive narrowness found in *Deltamys*. Muzzle narrow. Supraorbital edges rounded; slightly squared posteriorly, but not ridged. Brain-case smooth, without ridges. Interparietal present, but small. Zygomatic plate slanted in front, but not so narrowed as in *Oxymycterus* and *Microxus*. Palatal foramina long. Bullæ not specially enlarged.

*Teeth.*—Incisors slender, narrow, flat in front, fairly orthodont in set, the index about  $82^\circ$ . Molars quite unique in this group, highly hypsodont, almost as much so as in *Chinchillula*, though of so different a type to that as to make comparison difficult. They are just what *Akodon* teeth might be expected to become if made very hypsodont, high, narrow, with the vertical grooves extending far down towards the roots, of simple sectional pattern, that of  $m^2$  pandurate\*, that of  $m^1$  similar but with three lobes, the front one circular, and that of  $m^3$  subtriangular. The roots are long and peculiarly flattened laterally, and in consequence the alveolar

\* Ridgway, 'Nomenclature of Colours,' 1st edition, 1886, pl. xiv. fig. 18.

holes are deep narrow slits instead of being round.  $M^1$  has one long anterior root, one long internal one, and a postero-external more cylindrical; the usual median external one practically obsolete.  $M^2$  with three roots,  $m^3$  with two.

Pattern of unworn teeth not yet known.

Genotype. *Hypsimys budini*, sp. n.

This genus, while closely resembling *Akodon* in external characters, is readily distinguishable by its strongly developed hypsodontism, both roots and crowns of the teeth being highly modified. It is clearly a specially hypsodont *Akodon*, and has no near relationship to other hypsodont genera, such as *Chinchillula* or *Andinomys*, which belong to different groups of the subfamily. Its discovery is a most interesting addition to our knowledge of South American Muridæ, no very hypsodont member of this group having been hitherto known, although a slight hypsodontism is present in many of them.

The following is a description of the type-species:—

Size and general appearance very much as in *Akodon fumeus*, Thos., of Bolivia, to which the resemblance is so close that the two were supposed to be the same until the skull was examined. General colour above dark olivaceous, becoming warmer and browner on the rump. Under surface dark greyish, washed with whitish or buffy. A distinct white spot on the chin. Ears rather darker than head. Hands and feet greyish, the hairs at bases of claws white; claws comparatively long, the fourth anterior about 3 mm. in length, the posterior 2·8. Tail about as long as the body without the head, well-haired, distinctly bicolor, blackish above, whitish below.

Dimensions of the type (measured in the flesh):—

Head and body 89 mm.; tail 68; hind foot 21; ear 17. (An older specimen measures: head and body 115 mm.; tail 76; hind foot 23.)

Skull (of type): greatest length 27·5; condylo-incisive length 25·4; zygomatic breadth 14; nasals 10; inter-orbital breadth 4·2; breadth of brain-case 12·2; palatilar length 24; palatal foramina 6·8; upper molar series, crowns 4·3, alveoli 4·9.

*Hab.* as above.

*Type.* Young adult male. B.M. no. 18.1.1.44. Original number 47. Collected 29th August, 1917.

This interesting mouse is so exactly like one of the ordinary *Akodons* that no one would suspect its real peculiarities until the skull was examined. Indeed, it is so

like the Bolivian *A. fumeus* that I at first supposed it to be referable to that species, from which it is scarcely to be distinguished externally except by its long fore-claws.

Mr. Budin notes on one specimen, "caught at foot of pine tree—among the roots."

10. *Dasyprocta variegata boliviæ*, Thos.

♀. 7 (young). Manuel Elordi.

Recently described from Yacuiba.

11. *Sylvilagus brasiliensis gibsoni*, subsp. n.

♂. 1. Manuel Elordi, Vermejo, Salta, 500 m. 25th July, 1917. B.M. no. 18.1.1.8. *Type*.

Essentially similar to *S. b. paraguensis*, but the mottling of the upper surface slightly less strong and the general colour a little greyer. Crown with large greyish confluent patches at the anterior bases of the ears, only a very small greyish spot indicating their position in the allied form. Under surface whiter, the white of the chest extending up the chest above the level of the fore-limbs, and much reducing the greyish-buff collar, which is little more than an inch in antero-posterior diameter, as compared with three or four inches in *paraguensis*.

Skull about as in *paraguensis*. Postorbital processes not touching terminally the bone of the frontal behind. Occipital shelf with its posterior angles not developed, so that it is nearly semicircular in shape, while it is practically square in *paraguensis*; but only one specimen of *saltae* is available for comparison with three examples of *paraguensis*.

Dimensions of the type (measured in the flesh):—

Head and body 310 mm.; tail 10; hind foot 71; ear 55.

Skull: greatest length 62.5; condylo-incisive length 56; zygomatic breadth 31.5; upper tooth-series (alveoli) 12.

*Hab.* and *Type* as above.

The reduction of the dark collar and the presence of the grey patches at the bases of the ears clearly indicate a subspecific difference in this *Sylvilagus* of the Upper Vermejo, as compared with the form found in Paraguay.

This hare, the first and only known member of the group occurring naturally in Argentina, I have named after Mr. Ernest Gibson, to whom our Mammal Survey of the Argentine has been so immensely indebted for the help he has given in the collecting-trips of Messrs. Grant, Kemp, and Budin.

12. *Marmosa elegans cinderella*, Thos.

♂. 11, 25, 49, 51; ♀. 50. Leon, Jujuy.

*Type-locality.* Tucuman.

Mr. Budin notes that this little opossum is the culprit when rats and mice captured in the traps are found partly eaten. But it is certainly not always so, as I found in La Plata that the common *Akodon arenicola* freely eat their comrades in like case.

XX.—*The Generic Division of the Hedgehogs.*

By OLDFIELD THOMAS.

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IN the most recent paper on hedgehogs, that by Satunin\*, these animals are divided into three genera—*Erinaceus*, *Hemiechinus*, and *Macroechinus*,—the divisions being based on certain characters of the pterygoids and bullæ first pointed out and used by Dr. John Anderson.

But Satunin's paper, based as it is on Asiatic material only, and drawn up without access to the full literature of the subject, proves to need some modifications and corrections as to nomenclature, and the following notes may be of use to persons wishing to understand the grouping of these animals.

As material increases and has to be classified, labelled, and arranged in Museum collections, this close splitting of the genera proves to be of great assistance in carrying out the work with accuracy and convenience, and on this account I follow Satunin in using the groups as full genera.

Synopsis of genera:—

## A. Pterygoids and bullæ normal†.

a. Spines on crown divided into two groups by a median parting. Postglenoid processes small, not hollowed out, much surpassed by the mastoid processes.

a<sup>2</sup>. Hallux present.

a<sup>3</sup>. Coronal parting narrow, inconspicuous.

\* Ann. Mus. St. Petersb. xi. p. 1 (1907).

† As in Anderson, P. Z. S. 1895, p. 416, fig. 1, and J. A. S. B. xlvii. pl. iv

- Posterior palatal shelf narrow. Third incisor normally one-rooted ..... 1. *Erinaceus*.  
*b*<sup>3</sup>. Coronal parting broad, conspicuous. Posterior palatal shelf broad. Third incisor two-rooted ..... 2. *Æthechinus*.  
*b*<sup>2</sup>. Hallux absent ..... 3. *Atelerix*.  
*b*. No median parting on crown. Postglenoids as large as mastoids, hollowed internally \* ..... 4. *Hemiechinus*.  
 B. Pterygoids inflated, their cavity communicating with that of the bullæ; parapterygoid fossæ shallow †. Postglenoids even larger and more hollowed out than in *Hemiechinus*. *Æ* parting on crown ..... 5. *Paraechinus*.

## 1. ERINACEUS.

*Erinaceus*, Linn. Syst. Nat. (10) i. p. 52 (1758).

*Range*. Palæarctic Region, from Spain to China.

*Genotype*. *E. europæus*, Linn.

Other species and subspecies:—

*chinensis*, Sat.  
*concolor*, Mart.  
*consolei*, B.-Ham.  
*dealbatus*, Swinh.  
*hanensis*, Matsch.  
*hispanicus*, B.-Ham.

*italicus*, B.-Ham.  
*kreyenbergi*, Matsch.  
*nesiotes*, Bate.  
*roumanicus*, B.-Ham.  
*tschifuensis*, Matsch.  
*ussuriensis*, Sat.

## 2. ÆTHECHINUS, gen. nov.

*Range*. Africa from Algeria to the Cape; also just penetrating into Southern Europe (Spain and Balearic Islands).

*Genotype*. *Æ. algirus* (*Erinaceus algirus*, Duv. & Lereb.).

Other species and subspecies:—

*frontalis*, Smith.  
*sclateri*, And.

*vagans*, Thos.

Besides the characters mentioned in the synopsis above, this new genus differs from *Erinaceus* in the structure of the sole-pads and other details, which have been described by various authors when distinguishing *algirus* from *europæus*—notably by Miller, in his ‘Mammals of Western Europe,’ 1912. It is evidently a natural group, as the distribution shows, and clearly deserves a special name.

\* As in J. A. S. B. xlvii. pl. iv.

† As in P. Z. S. 1895, p. 416, fig. 2, and J. A. S. B. xlvii. pl. iii.



## 3. ATELERIX.

*Atelerix*, Pomel, Arch. Sci. Nat. Geneva, ix. p. 251 (1848).

*Peroechinus*, Fitz. SB. Wiss. Wien, liv. 1, p. 565 (1866) (type, *E. pruneri*, Wagn.).

*Range*. Northern Africa—Senegal to Egypt, southwards to British East Africa.

Genotype (now definitely designated). *A. albiventris* (*Erinaceus albiventris*, Wagn.).

Other species:—

*adanson*, Rochebr.  
*hindei*, Thos.

*spiculus*, Thos.

## 4. HEMIECHINUS.

*Hemiechinus*, Fitz. SB. Wiss. Wien, liv. 1, p. 565 (1866).

*Range*. Southern and Eastern Palæarctic Region, extending southwards into Egypt and Northern India.

Genotype (now selected and designated). *H. platyotis* (*Erinaceus platyotis*, Sund.).

Other species and subspecies:—

*alashanicus*, Sat.  
*albulus*, Stol.  
*auritus*, Gm.  
*brachyotis*, Sat.  
*calligoni*, Sat.  
*collaris*, Gray.  
*dauricus*, Sund. (?).  
*grayi*, Benn.

*megalotis*, Bly.  
*minor*, Sat.  
*miodon*, Thos.  
*persicus*, Sat.  
*przewalskii*, Sat.  
*russowi*, Sat.  
*turanicus*, Sat.  
*turfunicus*, Matsch.

Satunin and other authors have evidently supposed that *auritus* was the genotype of *Hemiechinus*, but that name is not included in Fitzinger's original paper, quoted above, where the first two species are both members of what is here called *Paraechinus*. But by my now formally selecting *platyotis*, Sund. (which is synonymized by Anderson with *auritus*), from Fitzinger's list as the genotype, the generic name may be retained for the group so termed by Satunin.

## 5. PARAECHINUS.

*Paraechinus*, Trouess. Rev. Mag. Zool. 1879, p. 242.

*Range*. From South-eastern Europe and Egypt to India.

Genotype. *P. micropus*, Bly. (syn. *pictus*, Stoll.).

Other species and subspecies:—

<i>æthiopicus</i> , Sund.		<i>hypomelas</i> , Brandt.
<i>blanfordi</i> , And. (syn. <i>jerdoni</i> , And.).		<i>macracanthus</i> , Blanf.
<i>deserti</i> , Loche.		<i>niger</i> , Blanf.
<i>dorsalis</i> , And. & de Wint.		<i>nudiventris</i> , Horsf.
		<i>pallidus</i> , Fitz.

## XXI.—*The Homoptera of Indo-China.*

By W. L. DISTANT.

### Fam. Cicadidæ.

I have previously (*ante*, (8) xix. p. 100 and xx. p. 319) enumerated 72 species of this family from Indo-China; the three following species here described bring the number now to 75 species:—

#### *Salvazana imperialis*, sp. n.

♀. Body above black; central anterior margin and posterior and lateral margins of pronotum and a large triangulate fascia to mesonotum virescent, the latter containing two small rounded basal black spots; anterior margin of vertex of head, a central discal spot to pronotum, and the cruciform basal elevation ochraceous, the last with the produced angles and an anterior marginal spot black; abdomen above purplish black; body beneath and legs purplish black; lateral margins of face, lateral segmental spots to abdomen, longitudinal fasciæ to intermediate and posterior femora and tibiæ more or less ochraceous; tegmina subhyaline, the costal membrane purplish red, about basal third green, opaque, margined with fuscous brown, the bases of the four upper apical areas, the apices of all the longitudinal veins to apical areas and the apical margin fuscous brown; wings with about basal halves sanguineous, remaining area hyaline with its margins fuscous brown, the outer margin being inwardly strongly notched.

Face strongly transversely striate and centrally longitudinally sulcate; femora robust; anterior tibiæ strongly sulcate on apical halves.

Length, excl. tegm., ♀, 35; exp. tegm. 117 mm.

*Hab.* Laos; Luang Prabang (*R. Vitalis de Salvaza*).

## VAGITANUS, gen. nov.

Head (including eyes) wider than base of mesonotum, about as long as breadth between eyes and as long as pronotum; pronotum much shorter than mesonotum, its lateral margins more or less oblique, straight, its posterior lateral angles a little amplified; mesonotum convex; abdomen in male almost as long as space between apex of head and base of cruciform elevation; tympanal coverings both narrower and shorter than tympanal orifices; opercula in male moderately short and oblique, not extending beyond the base of abdomen; anterior femora spined beneath; tegmina and wings hyaline, the first with its greatest breadth more than a third of its length, apical areas eight; wings with six apical areas.

Allied to *Cicadatra*, but differing by the relative breadths of the head including eyes and the base of mesonotum, &c.

*Vagitanus vientianensis*, sp. n.

♂. Head above ochraceous, ocelli margined with black; head beneath and face virescent; eyes brownish, spotted or mottled with black; pronotum castaneous, the central anterior margin and the broad posterior margin virescent; mesonotum brownish ochraceous with four obconical black spots, the two central spots smallest, the two lateral spots longest and almost crossing the mesonotum, a small rounded black spot before each anterior angle of the basal cruciform elevation, which is virescent with the anterior angles black; abdomen above and beneath ochraceous, above centrally piceous on basal half, beneath with a central black spot near base; sternum, opercula, and legs virescent; tegmina hyaline, venation on basal area castaneous, other veins black, costal membrane virescent, postcostal membrane brownish ochraceous; apical margin—from apex to commencement of seventh apical area—broadly fuscous; wings hyaline, venation either fuscous or virescent; opercula in ♂ obliquely directed inwardly, not meeting centrally, their apices rounded and not passing base of abdomen.

Long., excl. tegm., ♂, 17; exp. tegm. 49 mm.

Hab. Laos; Vientiane (*R. Vitalis de Salvaza*).

*Vagitanus luangensis*, sp. n.

♀. Body above dark brownish ochraceous; front of head with the anterior and frontal margin black; pronotum paler

and more virescent, with a large castaneous spot more or less margined with black on each lateral area and two small central curved spots near base; mesonotum with two anterior central obconical spots, and an outer elongate spot on each side, nearly crossing the mesonotal area, black; body beneath and legs greenish ochraceous, apices of tibiæ and the whole of the tarsi more or less black; tegmina and wings hyaline, tegmina with the costal membrane ochraceous, remaining venation black or blackish; tegmina with the apical margin from apex to commencement of eighth apical area broadly fuscous; face centrally longitudinally carinate; abdomen beneath with an obscure, central, macular, blackish fascia.

Long., excl. tegm., ♀, 17; exp. tegm. 47 mm.

Hab. Laos; Luang Prabang (*R. Vitalis de Salvaza*).

#### Fam. Fulgoridæ.

In this family I am now enabled to record a list of 37 species received from Mons. R. Vitalis de Salvaza, but this computation without doubt will be very largely increased when the smaller species are collected:—

<i>Pyrops dohrni</i> , Stål.	<i>Thessitus insignis</i> , Westw.
— <i>chinensis</i> , Dist.	<i>Purusha pulverosa</i> , Dist.
<i>Fulgora candelaria</i> , Linn.	<i>Ancyra appendiculata</i> , White.
— <i>nigrirostris</i> , Walk.	— <i>histrionica</i> , Stål.
— <i>viridirostris</i> , Westw.	<i>Dictyophara pallida</i> , Don.
— <i>astarte</i> , Dist.	<i>Dictyopharina consanguinea</i> , Dist.
— <i>vitalisia</i> , Dist.	<i>Neoputala capitata</i> , Dist.
— <i>atroalba</i> , Dist.	<i>Zoraida vuilleti</i> , Dist.
— <i>clavata</i> , Westw.	<i>Pochazia fuscata</i> , Fabr.
<i>Saiva gemmata</i> , Westw.	<i>Ricania speculum</i> , Walk.
<i>Penthicodes variegata</i> , Guér.	— <i>apicalis</i> , Walk.
— <i>pulchella</i> , Guér.	— <i>fumosa</i> , Walk.
— <i>caja</i> , Walk.	<i>Cerynia maria</i> , White.
<i>Kalidasa nigromaculata</i> , Gray.	var. <i>tenella</i> , Walk.
— <i>paulinia</i> , Sign.	<i>Salurnis marginellus</i> , Guér.
<i>Lycorma delicatula</i> , White.	<i>Pulastya abbreviata</i> , Dist.
<i>Euphria consimilis</i> , Dist.	— <i>discolorata</i> , Dist.
<i>Polydictya basalis</i> , Guér.	<i>Lavana conspersa</i> , Walk.
— <i>tricolor</i> , Westw.	— <i>optata</i> , Melich.

#### Subfam. FULGORINÆ.

##### *Fulgora vitalisia*, sp. n.

Head (including cephalic process) pale testaceous, the upper surface of cephalic process black, with a few scattered

greyish-white spots; an ochraceous spot before eyes and the eyes anteriorly margined with black; pronotum ochraceous, the anterior area brownish ochraceous; mesonotum pale testaceous, six black spots on anterior margin and a larger black spot near middle of each lateral margin, extreme lateral margins and the apex ochraceous; body above ochraceous, the metanotal area and the upper abdominal surface more or less greyishly tomentose, basal margin, lateral margins, a curved fascia at the union of the last two segments and the abdominal apex more or less black; abdomen beneath and legs more or less piceous, posterior femora a little paler, abdominal lateral margins sanguineous; tegmina pale virescent with numerous brownish-ochraceous spots margined with pale ochraceous, three near base, a double transverse series near middle of four spots each, the inner series waved, and about twelve spots on apical third, some of which are duplex; the apical area is also somewhat greyish; wings pale greenish-grey, the apical areas broadly black; cephalic process considerably upwardly recurved, becoming more laterally compressed from basal area to apex, measured from apex to eyes longer than from anterior margin of pronotum to abdominal apex.

Length ceph. process, angle from apex to eyes, 29; eyes to apex abdom. 25; exp. tegm. 95 mm.

*Hab.* Indo-China; Tonkin; Hagoang (*R. Vitalis de Salvaza*).

Allied to *F. connectens*, Atkins., and *F. astarte*, Dist.

*Fulgora atroalba*, sp. n.

Head (including cephalic process) bright ochraceous, its apex strongly globose; pronotum and mesonotum bright ochraceous; abdomen above pale dull ochraceous, thickly greyishly tomentose; body beneath ochraceous, legs black, abdomen beneath black, with the posterior segmental margins ochraceous; tegmina very pale ochraceous-white, a short transverse fascia at base, two transverse spots before middle, which are sometimes slenderly connected, and a costal spot near middle, black, apical area black with numerous ochraceous spots, of which the two largest are on costal and inner margins, these are preceded by about six smaller spots and three near apical margin, the remaining spots minute; wings dull creamy white, the apical area broadly black; cephalic process measured from angle of apex to eyes subequal in length to that of abdomen.

Length ceph. process, angle from apex to eyes, 14 ; eyes to apex abdom. 24 ; exp. tegm. 70 mm.

*Hab.* Indo-China ; Xieng Klouang (*R. Vitalis de Salvaza*).

By the globose apex of the cephalic process allied to *F. clavata*, Westw.

Subfam. *EURYBRACHYDINÆ*.

*Purusha pulverosa*, sp. n.

Head, pronotum, mesonotum, body beneath, and legs very dark castaneous, more or less greyishly tomentose, tibiæ and tarsi black ; tegmina black, more or less greyishly tomentose, the apical margin broadly pale brownish ; wings greyishly tomentose, the apical area pale brownish-ochraceous speckled with small greyishly tomentose spots ; vertex of head broad, more than twice broader than long, the apical margin transverse ; eyes distinctly spined ; face with the lateral margins obliquely directed outwardly to about middle and then more acutely directed obliquely inwardly to base of clypeus ; pronotum with a distinct central ridge ; femora moderately flattened and dilated ; anterior and intermediate tibiæ outwardly laminately dilated, the former more strongly so ; posterior tibiæ with five spines.

Length, excl. tegm., 16 ; exp. tegm. 64 mm.

*Hab.* Indo-China ; Tonkin (*R. Vitalis de Salvaza*).

This species may also be characterised by the long and somewhat attenuated tegmina and wings.

Subfam. *FLATINÆ*.

*Pulastya discolorata*, sp. n.

Body above virescent ; beneath ochraceous, the face and legs virescent, tegmina virescent with pale ochraceous suffusions ; wings pale greyish, the veins a little darker and in some places the veins are very pale virescent ; head obtusely roundly angulate, about as long as breadth at eyes ; face scarcely longer than broad, its lateral margins distinctly recurved ; tegmina with the costal membrane distinctly narrower than the radial area, the latter with distinct oblique transverse veins which are reticulately connected ; about as broad as wings, apically ampliate, apical margin truncate, its posterior angle angularly produced posteriorly.

Length, excl. tegm., 11 to 13 ; exp. tegm. 37 to 42 mm.

*Hab.* Indo-China ; Hanoi (*R. Vitalis de Salvaza*).

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## CONTENTS OF NUMBER 2.—*Ninth Series.*

	Page
XVI. Descriptions of Thirty-four Species of Marine Mollusca from the Persian Gulf, Gulf of Oman, and Arabian Sea, collected by Mr. F. W. Townsend. By JAMES COSMO MELVILLE, M.A., D.Sc. (Plates IV. & V.)	137
XVII. Descriptions and Records of Bees. — LXXIX. By T. D. A. COCKERELL, University of Colorado	158
XVIII. The Coleoptera of the Falkland Islands. By G. C. CHAMPION, F.Z.S.	167
XIX. On small Mammals from Salta and Jujuy collected by Mr. E. Budin. By OLDFIELD THOMAS	186
XX. The Generic Division of the Hedgehogs. By OLDFIELD THOMAS	193
XXI. The Homoptera of Indo-China. By W. L. DISTANT	195

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[NINTH SERIES.]

No. 3. MARCH 1918.

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XXII.—*Brief Descriptions of new Thysanoptera.*—IX.\*  
By RICHARD S. BAGNALL, F.L.S.

Suborder TEREBRANTIA.

Family Ceratothripidæ.

Genus CERATOTHRIPOIDES, nov.

Like *Ceratothrips*, but with a 2-jointed antennal style, the basal segment being stout.

Head transverse; maxillary palpi 3-jointed. Antennæ 7-jointed, about twice as long as the head, with the third segment very small and without trichome; style 2-jointed, with the basal segment stouter than the apical; forked trichome on segment 4.

Prothorax transverse, longer than the head, with two pairs of stout setæ at each posterior angle. Fore-wing with only a few setæ on distal half of upper vein.

Type. *Ceratothripoides brunneus*, mihi.

*Ceratothripoides brunneus*, sp. n.

Length about 1.1 mm.

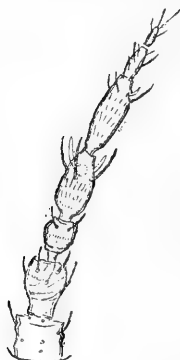
Colour brown, including upper wings; antennæ with joint 3 and extreme bases of 4 and 5 light; fore-tibia and

\* Continued from Ann. & Mag. Nat. Hist. ser. 8, vol. xvii. p. 412.

all tarsi yellowish. Excepting for antennæ, curiously like *Physothrips marshalli*, Bagn.

Head transverse, about 1.5 times as broad as long; eyes coarsely faceted, sparingly pilose; ocelli large, set well back; anterior one on or above a line drawn across centre of eyes; interocellar setæ present, strong; dorsal surface of head weakly striate at base and between eyes above the ocelli. Mouth-cone rather sharp, almost reaching across prosternum; maxillary palpi long, 3-jointed, the joints being approximately subequal in length. Antennæ about twice as long as the head; segment 3 small, pedicellate; 4 egg-shaped, about as broad as 2; 5 cylindrical; 6 broadly united to 5, sides of basal half subparallel, thence converging

Fig. 1.



*Ceratothripoides brumeus*, sp. n., ♀. Right antennæ,  $\times$  c. 200 diam.

to base of 7. Bifurcate sense-trichome on 4 and a single or simple trichome on 5 at outer side. Relative lengths of antennal segments as follows:—11 : 15 : 11 (with pedicel) : 18 : 22 : 9 : 6.

Prothorax slightly longer than the head, about 1.5 times as broad as long; hind angles broadly rounded, each furnished with two strong setæ, the inner longer than the outer and about 0.6 the length of the pronotum. Surface weakly striate transversely; sparsely spinose; spine on each side of median line of posterior margin about 0.3 the length of the inner postero-angular seta.

Pterothorax slightly longer than broad. Legs normal. Fore-wings about 15 times as long as broad near middle;

costa with 22-23 setæ; upper vein with 3+4 basally, a long space, and then 1+1 at extreme apex; lower vein with 17 setæ; all setæ smallish, cilia somewhat sparse.

Abdomen elongate-ovate, narrowing from segment 7 to apex; posterior margin of tergite 8 with a moderately long comb of minute setæ. Outer pair of postero-marginal setæ of segment 9 longer than the inner pair and 1.7 times the length of the tergite; inner pair on 10 higher up and longer than outer, just upon twice the length of the segment; a widely spaced pair of dorsal bristles, moderately long, on tergite 9.

*Type*. British Museum of Natural History (Imperial Bureau of Entomology).

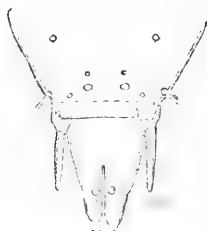
*Hab*. GOLD COAST, Aburi; 1 ♀ with *Eurhynchothrips convergens*, Nov. 5, 1915, on Cola-shoots and flowers (W. H. Patterson). Reg. 269, I.B.E. 103.

### Family Thripidæ.

#### *Odontothrips bispinosus*, sp. n.

♀.—This form, unfortunately represented by a solitary example, closely approaches *O. australis*, and a separate description is undesirable. It is lighter in colour, but the

Fig. 2.



*Odontothrips bispinosus*, sp. n., ♀. Dorsal view of end of abdomen, showing spines on segment 9; bristles and setæ omitted.  $\times$  c. 200 diam.

unique example is probably somewhat teneral. The pronotum is practically flat, with longer and more slender bristles at posterior angles. The pterothorax and abdomen are broader, and the latter, ignoring segments 8-10, is distinctly ovate. The comb of posterior margin of tergite 8 is practically lost, only 2 or 3 very minute micro-setæ showing at extreme ends, whilst the posterior angles of segment 9 are

each ornamented by a strong straight spine, which, with the basal part, is about 0·7 the length of the segment bearing them. The apical abdominal bristles are shorter and more slender, especially the dorso-median pair on segment 10, which are more slender than the others, and shorter than the corresponding pair on tergite 9, whereas in *australis* this particular pair of bristles are the longest of all the apical bristles.

The comparative lengths of the abdominal bristles of the two species are approximately as follows :—

		<i>bispinosus</i> .	<i>australis</i> .
Postero-marginal dorso-median pair,	9 . . . .	100	102
" " "	10 . . . .	93	125
Pair at posterior angles	9 . . . .	90	100
" " "	10 . . . .	90	100

The stout spines of the abdominal segment 9 are a distinctive feature—in fact, they may be regarded as unique in known Terebrantian *Thysanoptera*.

*Type*. In Coll. Bagnall, University Museum, Oxford.

*Hab*. W. AUSTRALIA, Perth; 1 ♀ with *O. australis*, sp. n. (*E. B. Poulton*).

*Odontothrips australis*, sp. n.

♀.—Length about 1·3 mm.

Colour dark chestnut-brown, fore-tibiæ lighter and all tarsi yellowish-brown; fore-wings brown, with basal fifth or thereabouts clear, though slightly tinged with light greyish-brown towards anterior margin. Antennal segment 3 light yellowish-brown, and a ring near base of 4 and 5 greyish to practically colourless.

Head approximately 1·22 times as broad as long. Cheeks slightly swollen behind eyes and thence practically parallel, posteriorly transversely striate; eyes large and coarsely faceted, occupying approximately 0·7 the total length of head; ocelli placed well back, posterior pair upon a line drawn just above the posterior margins of eyes; interocellar bristles short, placed immediately above the posterior ocelli. Antennæ twice as long as the head, sense-cone on inner surface of segment 6 (peculiar to the genus) normal. Relative lengths of segments 3 to 8 approximately as follows:—54 : 54 : 36 : 52 : 7 : 11. Pronotum apparently suborbicular, a little longer than the head and about 1·45 times as broad

as long; bristles at posterior angles about one-half as long as the pronotum. Anterior femora very broad viewed laterally, with the posterior margin strongly arched; fore-tibial teeth prominent, much as in *Odonthrips ulicis*. Fore-wings moderately slender, pointed at tip, 17 to 18 times as long as wide at middle; setæ on costa, upper and lower vein, 26-30, 23-26, and 20-23 respectively, short and slender, but those on costa and lower vein increasing in size towards the tip of wing, where they are more than usually long, being appreciably longer than the breadth of the wing.

Abdomen much as in *O. ulicis*, but apical bristles comparatively shorter and the comb (obsolete medianly in both species) short and sparse.

♂.—The male is much smaller than the female and has tergite 9 postero-medianly produced into two long "arms," as long as or overlapping segment 10.

*Type.* In Coll. Bagnall, University Museum, Oxford.

*Hab.* W. AUSTRALIA, Perth, Mundaring Weir, Darling Range; several examples of both sexes on flowers of a few prickly herbs with Papilionaceous red flowers, close together, August 3rd, 1914 (*E. B. Poulton*). Reg. no. 38.

The species may be distinguished from *O. ulicis*, Hal., by its smaller size, the very small interocellar bristles, shorter pronotal and abdominal bristles, etc. The structure of tergite 9 in the ♂ is distinctive.

*Aptinothrips ruficornis*, var. *connaticornis*, Uzel.

A common species in Europe and North America.

*Hab.* INDIA, Lebong, Darjeeling, Feb. 1909: 1 ♀ in tea-flowers with *Physothrips lefroyi*, Bagn. (*Maxwell Lefroy*).

*Pseudothrips achaetus*, Bagn.

♂.—I have now secured a good example of this sex, and find that the sternites 3 to 7 have a somewhat strongly transverse area on each, that on 3 being the smallest and 7 the largest. The specialized setæ on tergite 8 consist of but one pair somewhat close together, of normal form, slender, and about twice as long as the space between them.

*Additional Records.* W. AUSTRALIA, 1 ♂, Coltsloe Beach, near Fremantle, Aug. 31, 1914, and New South Wales, several ♀ ♀, Blue Mountains (Jenslan Caves to Mt. Victoria), in flowers of *Helichrysum* sp. (*E. B. Poulton*). Reg. 40 and 37 respectively.

*Physothrips brunneicornis*, Bagn.

Originally described from Japan.

*Hab.* INDIA, 1 ♀, teneral, Ringtong, T.E., Darjiling Dist., on rose, 14. vi. 1916 (*E. A. Andrews*). Reg. 287, I.B.E. 121.

*Physothrips brevicornis*, Bagn.

♂.—Much smaller than the ♀, with a large, broad, elliptical area on each of the sternites 3 to 7. Two pairs of specialized setæ on tergite 9 of normal form, the inner pair situated more posteriorly, long, being about twice the length of the outer pair.

*Additional Records.* AUSTRALIA, Melbourne, 1 ♀ and 1 ♂ in dandelion-flower, 1914 (*F. Spry*), Reg. 121; and Healesville, Victoria, both sexes in numbers on *Helianthus* sp., February 1914 (*R. Kelly*), Reg. 89.

*Physothrips peculiaris*, sp. n.

♂.—Length approximately 1.2 mm.

Colour light lemon-yellow, thorax and first two antennal segments of a little deeper shade, and head and last two abdominal segments of a brownish golden-yellow. Forewings clear excepting for a faint and ill-defined bar occupying the median third or thereabouts, and a short similar bar at extreme tip. Cilia and setæ faintly fuscous. Note: the specimens before me had been preserved in spirits for ten or so years before being mounted.

Head slightly broader across eyes (where it is broadest) than long, and not as long as the prothorax. Eyes prominent, coarsely faceted, occupying about 0.6 the length of head; ocelli large, interocellar setæ somewhat close together. Cheeks somewhat swollen immediately behind eyes, then slightly emarginate, widening again near base. Antennæ about three times as long as the head; basal joints approximate, distinctly stouter than any of the succeeding, which are more than usually slender, 3 and 4 constricted both



distally and basally, the former with pedicel. Relative lengths of segments approximately as follows:—29 : 40 : 78 : 76 : 47 : 64 : 15 : 19. Pronotum with sides rounded, not strongly transverse (about 1·3 times as broad as long); bristles at anterior angles somewhat prominent, about 0·2 the length of the pronotum; those at posterior angles only moderately long and strong, the inner pair longer than the outer and about 0·4 the length of the pronotum. Fore-legs more than usually long, rather stout. Wings long, moderately slender; the fore pair with setæ as follows: costa 23–26; upper vein 4 (3) + 7–10, running into the distal half, with 2 (3) in distal fifth; lower vein with 14–16. Abdomen long and slender. Tergite 9 with a series of two pairs of minute setæ, the outer pair being on a higher plane and a little longer than the inner; the bristle at posterior angles rather long, somewhat variable, strong, with a shorter stronger spine at each angle immediately within.

*Type*. In Coll. Bagnall, University Museum, Oxford.

*Hab*. INDIA, Pusa, Bengal, numerous ♂♂ on lucerne, Feb. 1906 (*H. Maxwell Lefroy*).

This striking species, on discovery of the ♀, may have to be removed from the genus *Physothrips*.

#### Suborder TUBULIFERA.

##### Family Phlæothripidæ.

##### *Haplothrips* group.

##### a. *Wings clouded*.

##### *Haplothrips fuliginosus* (Schille).

*Cryptothrips* (sic) *fuliginosa*, Schille, 1910, Acad. Litt. Cracov. xlv. p. 7.

*Haplothrips obscuripennis*, Bagnall, 1913, Ent. Month. Mag. ser. 2, xxiv. p. 264.

I have fortunately had the opportunity of examining co-types of Schille's *Cryptothrips fuliginosus*, and find that it cannot be referred to the genus *Cryptothrips* or any allied genus—that, in fact, it is a typical *Haplothrips*, and identical with the species I described under the name of *obscuripennis*.

Hood's *H. nubilipennis* comes very near to this species; it was described from a single example, and the colour of the

intermediate antennal segments is not well-defined as in *fuliginosus*.

*Distribution.* EUROPE (Galicia and England).

*Haplothrips victoriensis*, sp. n.

♀.—Length 1·7 to 1·9 mm.

Colour deep black-brown, fore-tibiæ brownish-yellow shading to yellow distally; hind and intermediate tarsi brown, fore-tarsi yellow; basal antennal segments yellow, very lightly touched with grey-brown; 4 yellowish-grey brown with basal third yellow; 5 a slightly deeper brown with basal fourth yellowish; 6 to 8 brown (lighter than basal joints) with extreme base of 6 in some examples feebly lighter. Wings fumate as in *fuliginosus*.

Head much as in *fuliginosus*, but shorter and broader, approximately as long as or only slightly longer than broad, cheeks very faintly rounded, slightly convergent posteriorly, minutely and sparsely setose; eyes occupying about 0·35 the length of head; postocular bristles long, stout, dilated apically. Antenna about twice as long as the head; segment 3 narrow, 4 large, broadest of all; relative lengths of segments 3 to 8 approximately as follows:—50 : 55 : 47 : 44 : 40 : 22. Pronotum about 0·8 the length of head and twice as broad as long; setæ stout, dilated apically, of the two at each posterior angle the outer is the longer, being about 0·55 as long as the pronotum; other pronotal setæ shorter. Forewings with 11 (10–12) duplicated cilia. Fore-femora incrassate, fore-tarsus unarmed. Pterothorax broad, approximately as long as broad. Abdomen a little broader than the pterothorax, gradually narrowing to segment 7 and thence more sharply to base of tube. Tube 0·8 as long as the head, more than half as wide at tip as at base and twice as long as wide at base. Bristles on segment 9 long, not as long as tube, slender, colourless; apical bristles as long as tube, stouter than those on 9, fuscous, but losing colour distally.

♂.—Smaller, more slender; head a little longer; fore-legs stouter and fore-tarsus armed with a short broadly seated tooth.

*Type.* In Coll. Bagnall, University Museum, Oxford.

*Hab.* AUSTRALIA, in the neighbourhood of Healesville,

Victoria, on *Acacia decurrens* v. *mollissima*; *Acacia fimbriata*; *Acacia melanoxydon*; *Prostanthera lasiantha*; *Davisia ulicina*; *Escallonia montevidensis* with larvæ; *Eryngium pandanifolium*; *Polygonum* sp.; roses; wall-flowers and amongst dead seeds of *Bursaria spinosa* (A. E. Shaw & R. Kelly). Warburton, Victoria, on *Senecio velleioides*, *Leptospermes scoparium*, and *Laurestinus* sp. (R. Kelly).

Distinguished from *H. fuliginosus* (Schille) by its larger size, deeper coloration, shorter head, etc. The postocular and pronotal setæ and those on the wing-scale are pointed in *fuliginosus* and are more slender than in *victoriensis*.

- b. *Form heavy, wings clear, broad basally and distally, without duplicated cilia.* Hab. AUSTRALIA.

*Haplothrips robustus*, sp. n.

♀.—Length 1·6 mm.; breadth of mesothorax 0·38 mm.

Colour brown, head, thorax, and end of abdomen darker; fore-tibiæ shaded yellowish distally and fore-tarsi yellowish. Antennal segments 1, 2, and 5 to 8 uniform dark grey-brown, 4 lighter brown, and 3 yellowish. Wings clear excepting for a light brownish patch at base. Hypodermal pigmentation heavy.

Head scarcely perceptibly longer than broad at base (where it is broadest), cheeks straight, widening posteriorly, though this may be exaggerated by pressure in mounting; vertex produced in the form of a hump, more pronounced than usual, upon the apex of which the overhanging anterior ocellus is seated. Postocular bristles short, blunt. Antennæ about 1·8 times as long as the head, segment 4 broader than either 3 or 5; relative lengths of segments 3 to 8 approximately as follows:—50 : 55 : 48 : 45 : 44 : 33. In one example segment 6 is longer (49 instead of 45) and at least half the suture between 7 and 8 is fused.

Prothorax 0·65 the length of the head and about twice as broad as long; setæ moderately long, blunt, colourless; the one at each posterior angle the longest, about 0·45 the length of the pronotum. Fore-tarsus armed with a minute tooth; fore-femora slightly incrassate. Wings broad, the fore pair being curiously broadened just beyond basal scale and again, but neither so strongly nor suddenly, beyond median constriction. Abdomen very slightly broader than pterothorax.

Tube 0·65 the length of head, less than twice as long as wide at base, and approximately twice as broad at base as at apex. Abdominal bristles somewhat long and slender, colourless; those at apex of tube also slender, about as long as tube, fuscous basally.

*Type.* In Coll. Bagnall, University Museum, Oxford.

*Hab.* S. AUSTRALIA, Adelaide, Mount Lofty Range, 1 ♀ from flowers of *Acacia myrtifolia* or *Epachris impressa*, Aug. 9, 1914; Outer Harbour, from flowers of *Mesonbryanthemum*, Aug. 28th, 1914 (*E. B. Poulton*). Reg. 41 and 43.

*Haplothrips melanoceratus*, sp. n.

This species agrees in almost every respect with *H. robustus*, sp. n., but may be sharply distinguished by the fact that the antennal segments 1-8 are all entirely of a uniform dark grey-brown. The tube is not so stout and the pronotum is more than twice as broad as long. The unique example appears to be slightly teneral, and, excepting for the antennæ, is noticeably lighter in colour.

*Type.* In Coll. Bagnall, University Museum, Oxford.

*Hab.* S. AUSTRALIA, Adelaide, Outer Harbour, in flowers of *Mesonbryanthemum* with *H. robustus*, 28. 8. 14 (*E. B. Poulton*). Reg. 43.

- c. *Wings clear, very slender distally, parallel-sided, with median constriction almost lost.*

*Haplothrips tenuipennis*, sp. n.

♀.—Length 1·5 mm., breadth of mesothorax 0·32 mm.

Colour chestnut-brown, end of abdomen inclined to be lighter, and tube lighter distally than basally. Fore-tibiæ and the extreme apices of intermediate and hind tibiæ lemon-yellow, the fore-tibiæ tinted with light grey-brown basally and towards margins; all tarsi light lemon-yellow. Antennal segment 1 concolorous with head, 2 yellowish distally; 3 to 6 yellow, 5 and 6 in some specimens shaded lightly with grey distally; 7 and 8 uniform light brown. Wings clear, faintly fuscous at bases.

Head as broad as long and 1·3 times as long as pronotum; postocular bristles moderately long, about 0·22 the length of

head. Antennæ at least 1·8 times as long as the head ; relative lengths of segments 3 to 8 approximately as follows :— 46 : 50 : 42 : 39 : 37 : 22. Prothorax transverse, about 2·3 times as broad as long ; all setæ present, blunt, those on posterior margins about 0·4 the length of pronotum. Fore-femora incrassate ; fore-tarsus unarmed. Fore-wings very narrow from about basal third and median constriction scarcely apparent ; lower margin with 8 (7–9) duplicated cilia.

Abdomen as broad or scarcely as broad as the pterothorax, gradually tapering to tube ; tube about 0·63 as long as head, 0·5 as broad at base as long, and 0·55 as broad at tip as at base ; sides evenly converging and no constriction at apex. Bristles at apex of tube distinctly longer than tube.

♂.—Smaller, body more slender. Fore-femora not strongly incrassate and tarsal tooth minute.

*Type*. British Museum of Natural History (Imperial Bureau of Entomology).

*Hab*. INDIA, Ringtong, T.E., Darjiling Dist., taken in numbers on tea-bushes (Reg. 286, I.B.E. 120) and on rose (Reg. 287, I.B.E. 121), 14. vi. 1916, by Mr. E. A. Andrews (of the India Tea Association).

### *Hindsiania melaleuca*, Bagnall.

*Hindsiania melaleuca*, Bagnall, 1911, Ent. Month. Mag. ser. 2, xxi. p. 61.

*Zygothrips bicolor*, Hood & Williams, 1915, Journ. New York Ent. Soc. xxiii. p. 126.

I found my original example of *H. melaleuca* in the Botanic Gardens, Copenhagen, and am interested to find that the *Zygothrips bicolor* of Hood & Williams, taken by Williams in Florida, is referable to the same species.

### *Podothrips duplicatus*, sp. n.

♀.—Length about 1·2 mm.

Like *Haplothrips aculeatus* in general appearance.

Colour brown, tube darker basally ; fore-tibia pale yellow, shaded along inner and outer margins with grey-brown ; hind and intermediate tibiae also pale yellow, lightly shaded with grey-brown medianly ; all tarsi yellowish, with brown fleck distally. Antennal joints 1 and 2 concolorous with head ;

3 yellowish; 4-8 brown, but of a lighter shade than head. Wings light smoky grey.

Head 1.5 times as long as the prothorax and only about as long as broad; cheeks apparently gently arched, with the appearance of converging posteriorly (this point is not clear in the unique preparation, due to pressure in mounting). Eyes in their greatest dorsal length occupying about one-third (0.33) the length of the head. Ocelli of moderate size, posterior pair above a line drawn across centre of eyes, anterior ocellus forwardly directed. Postocular bristles broken off in type. Antennæ approximate at base, about 1.8 times the length of the head; relative lengths of segments as follows:—10 : 14 : 15 : 15 : 14 : 14 : 14 : 11. Joints 2 to 7 practically subequal in length, gently diminishing in breadth; 3 broadly and roundly clavate; 8 pointed, slightly constricted at base. Mouth-cone short, reaching about halfway across prosternum, broadly rounded.

Prothorax twice as broad as long, the greatest breadth being scarcely narrower than width across fore-coxæ. All setæ present and well-developed; strongly dilated distally, those at posterior angles about 0.45 and those at anterior angles 0.36 the length of prothorax. A similar seta on each fore-coxa; fore-femur incrassate; fore-tibia stout, apically produced within into a sharp tooth; fore-tarsus armed with a short stout tooth. Pterothorax rather broader than long and than width across fore-coxæ. Metathorax laterally converging posteriorly. Wings slender, reaching to abdominal segment 6, constricted in middle, sparsely fringed, the fore-wing having four duplicated cilia.

Abdomen elongate, only as broad as the pterothorax, elongate, gradually narrowing from base of segment 7 to tube. Tube about 0.7 as long as the head, 0.47 as broad at base as long and nearly 0.6 (0.57) as broad at apex as at base; terminal hairs short and weak, about 0.4 the length of the tube. Paired wing-retaining setæ up to and including segment 7, the pair near posterior margin being stronger than the median dorsal pair. Abdominal setæ slender, dilated at apex, colourless, pointed pairs on 9 being as long as the tube.

Abundantly distinct from *P. semiflavus*, Hood, both as regards colour and structure, and necessitating some slight amendment of the original diagnosis of the genus.

*Type*. British Museum of Natural History (Imperial Bureau of Entomology).

*Hab.* GOLD COAST, Aburi, 1 ♀ on *Canna*-flowers with *Physothrips marshalli*, 30. xi. 15 (W. H. Patterson), Reg. 260, I.B.E. 94.

*Podothrips propinquus*, sp. n.

♀.—Length about 1.5 mm.

This form comes very near to *P. duplicatus*, sp. n. It is larger and somewhat more robust. The distal fourth or thereabouts of the fore-femora is light yellow; the antennal joints 3 and 4 are yellow, the latter lightly touched with brown.

The prothorax is comparatively shorter and more strongly transverse, and the posterior setae at least (also strongly dilated distally) are distinctly longer than in *duplicatus* (6:4), those at posterior angles being 0.55 and those at anterior angles about 0.35 the median length of the pronotum. The fore-tibia is produced into the form of a tooth at the apex within, but there does not appear to be a fore-tarsal tooth (one fore-foot is broken off and the other tucked under the head in the unique example). The relative lengths of the antennal joints 3 to 8 are as follows:—18:20:16:15:16:14.

There are 6–7 duplicated cilia in the fore-wings.

The tube is stouter basally, being about 0.55 as broad at base as long and a little less than half (0.47) as broad at apex as at base, 0.62 as long as the head. Terminal hairs short and weak.

*Type.* British Museum of Natural History (Imperial Bureau of Entomology).

*Hab.* GOLD COAST, Aburi, 5. xi. 12, 1 ♀ from “*Cola* shoots and buds” (W. H. Patterson). Reg. 269, I.B.E. 103.

*Trichothrips* group.

Genus EURHYNCHOTHRIPS, nov.

♂.—Head not as long as broad, with sides converging posteriorly, slightly longer than prothorax. Mouth-cone long, sides straightly narrowed to apex, reaching across prosternum, and as long as the dorsal length of head. Antennae 8-jointed, all joints well separated. Ocelli well forward, the anterior ocellus directed forwards.

Prothorax strongly transverse, more than twice as broad

as long and 1.5 as broad as head; with a well-developed accessory seta at each hind angle. Fore-tarsi (in male) unarmed. Wings broad, with sides subparallel. Tube basally, in male, only shallowly and broadly emarginate. Abdomen only moderately heavy.

This genus is separated from *Rhynchothrips* by the last and penultimate antennal joints not being short and closely united, the convergent cheeks, the stouter mouth-cone, and the shorter and transverse prothorax and more slender build.

It should be here noted that the two Trichothripid species, *Edemothrips brevicollis*, Bagn., from Japan, and *Edemothrips propinquus*, Bagn.\* (Australia), both described from female examples, may be referable, on the discovery of the respective males, to other genera.

Type. *Eurhynchothrips convergens*, mihi.

*Eurhynchothrips convergens*, sp. n.

♂.—Length about 1.8 mm., breadth of mesothorax 0.37 mm.

Colour chestnut-brown; tube lighter in distal half; fore-tibiae yellow, lightly shaded with brown on the outer margin and near the base within; all tarsi yellowish. Antennæ with segment 1 brown, 2 brown shading to yellow, 3 to 6 yellow, 3 pale, 4 and 5 tinged lightly with brown distally, 6 with distal half or thereabouts brownish, and 7 and 8 wholly light brown. Wings clear, scale of fore-wing brown, cilia dusky.

Head a little more than 0.8 as long as broad immediately behind eyes; cheeks faintly rounded, converging posteriorly, about 0.85 as broad at neck as behind eyes. Eyes broadly rounded, occupying in their greatest dorsal length approximately 0.4 the length of the head; space between them about 0.4 the greatest width of the head. Vertex not produced, ocelli large, posterior pair above a line drawn through centre of eyes and contiguous to their inner margins, anterior ocellus forwardly directed. Antennæ twice or a little more than twice as long as the head, set below the vertex with the basal joints subapproximate; joint 4 broader than 3 or any of the others. Relative lengths of joints 3 to 8:—20 : 22 : 20 : 23 : 22 : 16; 3 claviform, 4 and 5 broad and roundly claviform, 6 to 8 narrower, elongated. One stout sense-cone on outer side of segment 3, 1+2 similarly stout cones on 4,

\* This must not be confused with *Trichothrips propinquus*, Bagn., an English species.



1+1 on 5 which are not so stout, and 1+1 slender cones on 6; 1 long slender one on 7.

Sense-bristles at end of maxillary and labial palpi long. Postocular setæ about as long as the eye, apex dilated.

Prothorax about 0.8 as long as the head and a little more than 1.5 times as broad, from 2.1 to 2.4 times as broad as long. All setæ present, colourless, and also a well-developed accessory pair at posterior angles, dilated apically; those at posterior angles the longest, about 0.6 the length of the pronotum, those at the anterior angles being about 0.35 the length. Fore-coxæ scarcely projecting, each furnished with 1 prominent seta. Femora somewhat stout, fore-femora short, incrassate; fore-tarsi simple, unarmed. Pterothorax only slightly broader than long. Wings only reaching to about abdominal segment 6; broad, fore-wings about 10 times as long as broad; duplicated cilia 11 to 14, in two cases 17 and 18.

Abdomen only a little broader than the pterothorax, gradually narrowing to tube from segment 6. Tube about 0.9 as long as the head, twice as long as broad at base, and little more than 0.4 as broad at apex as at base. Terminal hairs brownish, about 0.6 as long as the tube. Abdominal setæ well developed, yellow or colourless, dilated at apex, those on 9, but slightly dilated at apex, are a little more than 0.8 the length of the tube.

*Type.* In British Museum of Natural History (Imperial Bureau of Entomology).

*Hab.* GOLD COAST, Aburi, Nov. 5, 1915, ♂s only on *Cola*-shoots and buds (*W. H. Patterson*). Reg. 269.

The larva (advanced stage) of this species is yellowish-white (in spirit), with rows of brown spots across meso- and metanotum and a single row across each abdominal segment 1-7. Pronotum with two brown "plate" patches almost adjoining; region of first two pairs of stigmata brown, and abdominal segment 8 with lateral brown patches. Abdominal segments 9 and 10 tube-like. Head small, with a pair of brown eye-spots, and basal antennal joints brownish.

*Trichothrips longicornis*, Bagn.

1913. Ann. & Mag. Nat. Hist. ser. 8, xii. p. 293.

This species was originally described from numerous dried specimens in the British Museum, labelled "Sierra Leone."

There are several examples in Mr. Patterson's collection, and a comparison with the original specimens makes it necessary to amend and amplify the description. It is larger than originally stated, being about 1.8 mm. long, and as regards colour the apical and penultimate antennal joints are chestnut-brown, of a lighter shade than the body. The prothorax has the postero-marginal setæ moderately long, those at posterior angles being about 0.4 the length of the prothorax; the mid-lateral pair is shorter, whilst the antero-marginal pairs are quite short, thus differing markedly from the prothoracic setæ in *T. femoralis*, Moulton. There are two rather stoutish genal spines at about the basal fourth of head.

♀.—*Forma macroptera*.—The wings are rather stout, reaching to the abdominal segment 7; clear with smoky-grey cilia and without (apparently) any duplicated cilia, thus again demonstrating the species' close relationship to *T. femoralis*.

*Hab.* GOLD COAST, Aburi, one macropterous and several apterous females and a few young larvæ, from a "conical gall (not made by thrips) on leaves of undetermined plant," November 17, 1915. Reg. no. 263.

### *Cryptothrips* group.

#### *Cryptothrips shavianus*, sp. n.

♂.—Length about 3.0 mm., belonging to the *major*, Bagn.-*carbonarius*, Hood, group.

Colour dark blackish brown, abdomen up to the fifth or sixth segment lighter, but apically very deeply pigmented black. Fore-tarsus and apex of fore-tibia yellowish-brown. Antennal segment 2 apically yellowish, 3 yellow lightly touched with brown distally, 4 grey-brown with basal third or thereabouts yellowish, basal fourth of 5 similarly yellowish and extreme base of 6 yellowish, which is scarcely noticeable in one example. Wings of a light smoky greyish-yellow, lighter (to almost clear) distally; fore-wings with scale and a small basal patch brown, and with two roughly defined lines (the part between being light) running for two-thirds the length of wing; lower wing with a similar double line, which is, however, situated closer to the upper margin of wing.

Head large, approximately rectangular, converging very slightly posteriorly, 1.3 times as long as broad. Eyes small,

occupying 0·22 the total length of head, finely faceted; ocelli rather small, posterior pair widely separated, contiguous to inner margins of eyes near their lower fourth. Postocular bristles blunt, about as long as the length of an eye; the pair just behind posterior ocelli minute (as large as the postocular bristles in *C. carbonarius*). Antennæ about 1·35 times as long as the head, segments 3 to 6 roughly clavate; 3 but slightly longer than 4 and 5 slightly shorter than 4.

Prothorax very short (as in *C. collaris*, Bagn.), with the anterior margin strongly emarginate, median length approximately 0·3 the length of the head; all usual setæ present, the spine at each posterior angle being much the longest and stoutest, and the antero-marginal pairs the shortest. Wings broad, with margins subparallel and ends rounded; with 16 to 22 duplicated cilia. Fore-tarsal tooth small.

Abdomen not much broader than pterothorax, sides practically parallel to segment 6; 8 laterally angulate at basal third. Tube stout, less than twice as long as wide at base and more than two-thirds (about 0·7) as long as the head, distinctly constricted at apex. Bristles on 7 to 9 especially strong, long, and black, those on 9 about 0·8 the length of tube; those at apex of tube slender, as long as the tube. A pair of leaf-like ventro-median laminæ on segment 11 (apex of tube).

*Type.* In Coll. Bagnall, University Museum, Oxford.

*Hab.* AUSTRALIA, Healesville, Victoria, 2 ♂s taken on branch of *Acacia linearis* with galls, 31. i. 16 (*R. Kelly*). Reg. no. 254.

I have pleasure in naming this species in honour of Dr. Eland Shaw, of Healesville, Victoria, who has secured me much interesting material, and has enriched entomology in other directions.

### Family Idolothripidæ.

#### Genus KLINOTHRIPS, nov.

Species of moderate size.

♂.—Head much as in *Kleothrips*, Schmutz, the produced part beyond the eyes representing 0·2 of the total length of the head. Anterior ocellus set near the base of the produced part, protected by a pair of setæ; eyes finely faceted, postocular setæ set in tubercles. Antennæ about 1·5 times the length of head. Prothoracic setæ set in tubercles. Wings

reaching to abdominal segment 4. Fore-coxæ prominent, fore-femora very sharply bent basally, causing a prominent angle at base within; the outer radius adorned by two prominent spine-set tubercles, one short and straight, the other larger, slightly curved, and surmounted by a curved spine; a strong curved spine springs from a prominence at anterior angle without, much as in *Dicaiothrips*. Abdomen elongated, tube short, about 1·2 times as long as segment 8 and only 0·6 the length of head.

Fig. 3.



*Klinothrips femoralis*, gen. et sp. n., ♂. Left fore-leg.

This species is separated from ♂ *Mecynothrips*, Bagn., by the less strongly produced head, the simple prothorax, and the structure of the fore-femora; and from *Kleothrips* (= *Dracothrips*, Bagn.) and *Dicaiothrips*, Bufo., by the last-named feature. It should be noted that, with the exception of *D. nitidus*, Bagn., the head in *Dicaiothrips* is only slightly produced, never as much as either the length of an eye or of the base of the produced part.

Type. *Klinothrips femoralis*, sp. n.

*Klinothrips femoralis*, sp. n.

♂.—Length 7·5 mm.

With the characters of the genus.

Colour dark chestnut-brown; antennal joint 3 yellow, tinged with brown distally.

Head widest across eyes, where it is about 0·35 as total length of head, more than twice as long as the pronotum. Relative lengths of antennal joints 3 to 8 approximately as follows:—72 : 56 : 48 : 29 : 23 : 18; 4 and 5 claviform.

Prothoracic setæ stout and spine-like.

*Type.* In British Museum of Natural History (Imperial Bureau of Entomology), 1 ♂ described from an unmounted spirit-specimen.

*Hab.* GOLD COAST, Aburi, from the foliage of *Cacao*, 1 ♂, Nov. 12th, 1915 (*W. H. Patterson*). Reg. no. 275, Imp. Bur. Ent. no. 103.

#### Genus KLEOTHRIPS, Schmutz.

*Kleothrips*, 1913 (July), K. Akad. Wiss. Wien. math.-naturw. Kl. cxxii. p. 1057.

*Dracothrips*, 1914 (Mar. 1), Ann. & Mag. Nat. Hist. ser. 8, xiii. p. 290.

#### Genus EIDOTHRIPS, nov.

Species of moderate size.

Head long, at least 2·5 times as long as broad, feebly and gently narrowed behind eyes and thence swollen towards base; eyes finely faceted; head only slightly produced beyond eyes for reception of antennæ, which are very slender and more than twice as long as the head. Prothorax small, simple in both sexes. Pterothorax largish, broader than the abdomen. Wings with median vein reaching beyond middle; fore-wings slightly broadened before apex, fringe close, not long, and of rather even length, with numerous duplicated cilia at the lower margin near apex. Femora, tibiæ, and tarsi of front legs unarmed in both sexes. Tube at least 1·5 times as long as the head.

♂.—Abdominal segment 5 with a posteriorly directed pair of lateral curved horn-like processes; 6 with a shorter straight pair situated near the posterior third of segment; 9 with posterior angles produced into spine-set tubercles. Tube, in ♂ only, with surface scabrous or coarsely aciculate, excepting the distal fourth.

*Type.* *Eidothrips alluaudi*, sp. n.

#### *Eidothrips alluaudi*, sp. n.

Length 5·4 to 6·0 mm.

With the characters of the genus.

Colour dark chestnut-brown, antennal segment 3 yellow with basal sixth brown, and 4 also yellow lightly shaded with brown basally, both tinged with brown at apices; veins of wings, scale, and upper margin at base brown, otherwise clear

but for a faint yellowish tinge near margins. Spines at posterior margin of abdominal segment 9 clear yellow. Relative lengths of antennal segments 3 to 8 approximately as follows :—45 : 29 : 23 : 18 : 8 : 7.

*Type.* In Coll. Alluaud et Jeannel.

*Hab.* UGANDA, Kijabé, situated on the Uganda Railway in the forest of the Kikuyu escarpment, Dec. 1911 (*Alluaud et Jeannel*).

### Genus KRINOTHRIPS, nov.

Species of moderate size.

Agreeing with *Eidothrips*, gen. nov.; head more noticeably narrowed behind eyes and tube less than 1.5 times as long as the head, similar in both sexes.

♂.—Abdominal segment 5 simple, 6 with a posteriorly directed pair of lateral, curved, horn-like processes, 7 swollen and laterally tuberculate-dentate; 8 irregularly swollen and 9 simple. Tube practically smooth, as in ♀.

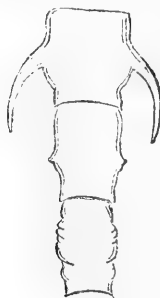
*Type.* *Krinothrips divergens*, sp. n.

#### *Krinothrips divergens*, sp. n.

Length about 7.0 mm.

With the characters of the genus.

Fig. 4.



*Krinothrips divergens*, gen. et sp. n., ♂. Dorsal view of abdominal segments 6-8, outline only.

Colour dark chestnut-brown; tarsi, extreme apex of fore-tibia, intermediate tibia distally, and hind tibia in distal half

yellow or yellowish. Antennal joint 3 light yellow, 4 and succeeding joints yellow lightly tinged with brown excepting apices of 4 and 5, 6 to 8 being practically yellowish-brown. Wings much as in *Eidothrips aluaudi*, with the median veins narrowly yellowish-brown; cheeks with a few pairs of minute spiniferous tubercles; outer margins of femora with some longish blunt or knobbed colourless setæ. Tube sparingly but regularly setose in both sexes, less than 1.4 times as long as the head. Pronotum about 0.45 the length of the head. Relative lengths of antennal joints 3 to 8 as follows:—55 : 36 : 30 : 24 : 12 : 11 (or 10.5). Fore-femora and tibiæ in the ♂ more strongly and noticeably pilose than in the ♀.

*Type.* British Museum of Natural History (Imperial Bureau of Entomology).

*Hab.* GOLD COAST, Aburi (not on leaves of *Cacao*), Adawsi Rd., 27. 1. 14 (*W. H. Patterson*), Reg. 282; I.B.E. no. 116.

### XXIII.—Notes on the Braconidæ in the British Museum.—

III. On new Australian Agathinæ. By ROWLAND E. TURNER, F.Z.S., F.E.S.

#### *Key to the Australian Species of Cremnops.*

1. Hind femora blackish; wings of the female yellow at the base and with a broad yellow band below the stigma, of the male fuscous with a narrow diaphanous band below the stigma. . . . . *C. dissimilis*, Turn.  
Hind femora testaceous red; wings not differing in colour sexually. . . . . 2.
2. Wings yellow basally from the nervulus and in the region of the stigma . . . . . 3.  
Wings fuscous, only marked with yellow in the region of the stigma . . . . . *C. xanthostigma*, Szép.
3. The yellow colour of the wings extending unbroken from the base as far as the apex of the second cubital cell . . . . . *C. marginipennis*, Turn.  
The yellow area interrupted by a broad fuscous band from the base of the stigma. *C. commutator*, Turn.

*Cremnops xanthostigma*, Szép.

*Cremnops xanthostigma*, Szép. Termes. Fuzetek. xxiii. p. 61 (1900). ♀.

A specimen from Kuranda, N. Queensland, agrees fairly well with the description, but has only a small yellow spot at the base of the stigma. A series of males from Mackay show variations in this mark, which is usually fairly large and triangular as in Szépligeti's description.

*Hab.* New Guinea (*Biró*) ; Kuranda (*Turner*), May 1913 ; Mackay (*Turner*), January 1898.

*C. fulgidipennis*, Cam. (1911), from the Solomon Islands, is extremely close to this, but has the terebra rather longer and the yellow spot at the base of the stigma almost obsolete. Cameron placed the species in *Agathis* ; but it is a *Cremnops*.

*Cremnops dissimilis*, sp. n.

♀. Rufo-ferruginea ; capite, segmento mediano, femoribus posticis, tibiis posticis apice, tarsisque posticis, abdomine segmento quarto sequentibusque, valvulisque terebræ nigris ; alis fuscis, anticeis basi ad nervulum, fasciæque lata sub stigmate, posticis tertio basali fasciæque lata post medium flavis.

♂. Feminae similis ; alis basi etiam fuscis, anticeis fascia irregulari flavo-hyalina sub stigmate.

Long. 8 mm. ; terebræ long. 4 mm.

♀. Face shining, finely punctured ; marginal carinæ of the frontal depression extending to the posterior ocelli. Middle lobe of the mesonotum marked with two distinct and narrow longitudinal grooves separated from each other by a distinct carina. Median segment with coarse transverse striæ and the usual longitudinal carinæ, the two middle carinæ diverging slightly towards the apex, a small enclosed triangular area at the base of the posterior truncation. First tergite twice as long as its apical breadth in the female, considerably shorter in the male. Second cubital cell subquadrate. The stigma is almost entirely yellow in the female, but fuscous on the apical half in the male.

*Hab.* Mackay, Queensland (*Turner*), March to May, 1900.

*Cremnops marginipennis*, sp. n.

♀. Rufo-testacea ; capite, valvulis terebræ, tibiis posticis apice tarsisque posticis nigris ; clypeo, mandibulis palpisque testaceis ; alis pallide flavis, post cellulam cubitalem secundam latissime fusco-marginatis.



♂. *Feminæ* simillimus, segmentis abdominalibus quarto sequentibusque nigris.

Long. 7–8 mm.; terebræ long. 3 mm.

♀. Face shining, almost smooth; marginal carinæ of the frontal depression extending to the posterior ocelli. Anterior portion of the mesonotum with two very shallow longitudinal grooves, separated by a low and indistinct carina. Median segment coarsely reticulate; the two median carinæ of the dorsal surface diverging slightly towards the apex; a small enclosed triangular area at the base of the posterior truncation. Abdomen smooth and shining; first tergite twice as long as its apical breadth in the female, shorter in the male. Legs, valvulæ, and costa of both pairs of wings clothed with very short hairs. Second cubital cell subquadrate; the vein dividing the first cubital and first discoidal cells obsolete in the middle.

*Hab.* Kuranda, N. Queensland (*Turner*), May 1913, 1 ♀ (type), 1 ♂ (cotype); January 1902, 1 ♀.

*Cremnops commutator*, sp. n.

♀. Rufo-testacea; capite, abdomine segmentis quarto sequentibusque, valvulis terebræ, tibiis posticis apice, tarsis posticis basi lato testaceo annulatis, unguiculisque nigris; alis fuscis; anticis basi usque ad nervulum, fasciaque lata sub stigmate; posticis tertio basali et fascia lata flavis.

Long. 9 mm.; terebræ long. 3 mm.

♀. Face shining and finely punctured; marginal carinæ of the frontal depression reaching the posterior ocelli; median lobe of the mesonotum with two well-marked longitudinal grooves. Median segment with the usual longitudinal carinæ, the spaces between the carinæ with a few coarse transverse striæ. Second cubital cell subquadrate.

*Hab.* Mackay, Queensland (*Turner*), October to May; Kuranda, N. Queensland (*Turner*), July 1913; Townsville, Queensland (*Dodd*); Port Darwin (*J. J. Walker*).

Closely allied to *Cremnops papuana*, Cam. (described as *Agathis p.*), but in that species the face is ferruginous. In the present form many specimens have the abdomen entirely rufo-testaceous, and the extent of the yellow band on the hind wing varies considerably, but I do not think that there are any differences of specific importance.

*Braunsia wallacei*, sp. n.

♀. Ferruginea; antennis, articulis duobus basalibus exceptis, segmentis dorsalibus tertio sequentibusque, valvulisque nigris; tarsis posticis, infuscatis; alis fuscis, unicoloribus.  
Long. 9 mm.; terebræ long. 6 mm.

♀. Antennæ rather slender; mesonotum in front without grooves. Median segment with one well-defined longitudinal carina from the base to the middle, continued less distinctly in a depression to the apex, the sides of the depression indistinctly margined. First tergite a little less than twice as long as its apical breadth, the apical half strongly longitudinally striated; second tergite and basal area of the third coarsely longitudinally striated, apical area of the third tergite entirely smooth; basal area of the second tergite equal to the apical area of the third and distinctly longer than either of the two intermediate areas. First cubital and first discoidal cells not divided; second cubital cell subtriangular, almost pointed on the radius, with a distinct stump of a nervure springing from the second transverse cubital nervure, the stump somewhat longer than that nervure. An oblique, irregular, hyaline streak runs outwards from the base of the stigma.

*Hab.* Dorei, New Guinea (*Wallace*).

*Braunsia diversipennis*, sp. n.

♂. Rufo-ferrugineus; capite nigro, mandibulis palpisque testaceis; tarsis posticis fuscis; alis dimidio basali flavis, dimidio apicali fuscis; stigmatè, maculaque magna sub stigmatè cellula cubitali secunda includente flavis.  
Long. 11 mm.

♂. Eyes large and round; antennæ stout, the second joint very short and broad. Mesonotum in front without grooves, the parapsidal furrows strongly developed. Median segment with two median longitudinal carinæ, which converge towards the base and unite before the base. First tergite strongly longitudinally striated, the striæ not continued to the base, the basal half with strong lateral carinæ; the segment about twice as long as its apical breadth. Second tergite and basal area of the third tergite coarsely longitudinally striated, the two divisions of the second tergite equal in length, longer than the striated basal area of the third tergite, but distinctly shorter than the entirely smooth apical area of that segment.

The nervure separating the first cubital and first discoidal cells is distinct; second cubital cell pentagonal, with a distinct stump of a vein from the middle of the second transverse cubital nervure, the stump almost equal in length to the cubital margin of the cell. The yellow colour of the wings extends from the base to beyond the nervulus; the yellow spot below the stigma includes the apical half of the first and the whole of the second cubital cells and the base of the radial cell, and extends beyond the second transverse cubital nervure.

*Hab.* Mackay, Queensland (*Turner*).

Allied to *fasciata*, Enderl., but differs in the total absence of striæ on the apical division of the third tergite, in the red apical segments of the abdomen, the black head, and in details of colour and neururation of the wings.

*Key to the Australian Species of Disophrys.*

- |   |                                 |
|---|---------------------------------|
| 1. Mesonotum black .....  | 2.                              |
| Mesonotum red .....   | 3.                              |
| 2. Wings pale fusco-hyaline, slightly tinged with yellow .....  | <i>D. nigropectus</i> , Turn.   |
| Wing yellow to the apex of the stigma, crossed by a fuscous band from the base of the stigma, the apex broadly fuscous. | <i>D. similipicta</i> , Turn.   |
| 3. Hind femora black, sometimes stained with red at the base .....  | <i>D. diversipes</i> , Turn.    |
| Hind femora red, rarely black at the extreme apex .....   | 4.                              |
| 4. Wings fuscous, the stigma and a spot below it yellow .....   | <i>D. signatipennis</i> , Turn. |
| Wings yellow or subhyaline on the basal third at least .....  | 5.                              |
| 5. Head red .....   | 6.                              |
| Head black, the face rarely red .....   | 7.                              |
| 6. Wings subhyaline, crossed at the base of the stigma by a pale fuscous band .....                                     | <i>D. diluta</i> , Turn.        |
| Wings yellow on the basal third and crossed by a flavo-hyaline band from the base of the stigma .....                   | <i>D. exornata</i> , Turn.      |
| 7. Face red .....   | <i>D. rufifrons</i> , Turn.     |
| Face black .....  | <i>D. ruberrima</i> , Turn.     |

*Disophrys signatipennis*, sp. n.

♂. Rufa; mandibulis palpisque rufo-testaceis; capite, segmentis abdominalibus tertio sequentibusque, femoribus posticis apice, tibiis posticis supra, tarsisque posticis nigris; alis nigris, stigmatum maculaque sub stigmatum flavis.

Long. 10 mm.

♂. Face closely and very distinctly punctured; the two interantennal ridges well developed; the marginal carinæ of the frontal depression well defined; vertex shining, sparsely punctured. Mesonotum sparsely and rather finely punctured; the depression at the base of the scutellum large and marked with three strong longitudinal carinæ; mesopleuræ almost smooth behind, punctured in front. Median segment transversely striated in the spaces between the usual longitudinal carinæ, the sides of the segment finely punctured-rugulose. Hind coxæ sparsely and finely punctured. Abdomen smooth and shining; an indistinct, transverse, impressed line near the middle of the second tergite. Second cubital cell subquadrate. The flavo-hyaline mark below the stigma extends into the second cubital cell, and below the cubitus along the recurrent nervure.

*Hab.* Kuranda, N. Queensland (Turner), July 1913.

*Disophrys ruberrima*, sp. n.

♀. Rufa; mandibulis basi palpisque testaceis; capite, tibiis posticis apice tarsisque posticis nigris; alis anticis fuscis, basi ad nervulum, stigmatē, maculaque magna sub stigmatē cellulam cubitalem secundam includente flavis; posticis dimidio basali flavo, dimidio apicali fusco.

Long. 13 mm.

♀. Face finely and closely punctured, vertex more sparsely punctured, the two interantennal ridges distinct but rather low, the marginal carinæ of the frontal depression well marked. Antennæ nearly as long as the whole insect. Mesonotum shining, with a few minute punctures, the parapsidal furrows distinctly crenulate; the depression at the base of the scutellum large, with three strong longitudinal carinæ. Median segment finely rugulose; with a small diamond-shaped enclosed area in the middle of the dorsal surface; from the apex of this area a carina runs to the apex of the segment, a curved lateral carina on each side of the median area and a transverse basal carina; the sides of the segment finely and closely punctured. First tergite a little more than half as long again as its apical breadth; the transverse line on the second tergite almost obsolete.

*Hab.* Mackay, Queensland (Turner); Townsville, Queensland (Dodd).

*Disophrys rufifrons*, sp. n.

♀. Rufo-testacea; vertice, antennis, tibiis posticis apice, tarsisque

posticis nigris; alis flavis dimidio basali, fuscis dimidio apicali; anticis stigmatè maculaque magna sub stigmatè cellulam brachialem attingente flavis.

Long. 10 mm.

♀. Head and thorax almost smooth; the interantennal ridges low, the marginal carinæ of the frontal depression well marked. Parapsidal furrows feebly crenulated. Enclosed area of the median segment broadly oval, extending to the apex.

*Hab.* Port Essington, Northern Territory (*Gould*).

Very similar to *ruberrima*, differing in the sculpture, in the smaller size and paler colour, in the colour of the face, and in the larger extent of the yellow mark below the stigma.

*Disophrys diversipes*, sp. n.

♀. Rufo-testacea; capite nigro, clypeo, mandibulis, apice excepto, palpisque rufo-testaceis; segmentis abdominalibus quartosequentibusque, femoribus posticis, basi supra rufo-lineatis, tibiis posticis apice, tarsisque posticis nigris; alis dimidio basali flavis, dimidio apicali fuscis; anticis stigmatè fasciaque lata sub stigmatè flavis. Long. 10–11 mm.

♀. Face shining, sparsely and shallowly punctured, vertex smooth and shining; interantennal ridges rather low, the marginal carinæ of the frontal depression well developed. Median lobe of the mesonotum marked with a low longitudinal carina in front, with a distinct groove on each side of the carina; parapsidal furrows not crenulate. Median segment transversely rugulose between the longitudinal carinæ; the enclosed median area elongate-ovate, not reaching the apex of the segment. First tergite nearly twice as long as broad, second tergite without a transverse line. The yellow fascia of the fore wing nearly reaches the lower margin of the wing in the type, in some other specimens quite, leaving a detached fuscous band across the wing from the base of the stigma.

*Hab.* Kuranda, N. Queensland (*Turner*), May 1913; Mackay, Queensland (*Turner*).

Easily distinguished from *ruberrima* and *rufifrons* by the black hind femora and the black apical segments of the abdomen.

*Disophrys exornata*, sp. n.

♀. Rufo-testacea; antennis, tibiis posticis tertio apicali, tarsisque posticis nigris; alis tertio basali flavis, anticis fascia sub stigmatè

et stigmatis dimidio basali flavis, posticis cellulæ radialis macula flavida.

Long. 7 mm.

♀. Face shining, minutely punctured, vertex smooth and shining; the interantennal ridges low but distinct, the carinæ bordering the frontal depression well developed. Mesonotum very finely punctured, the middle lobe with a low longitudinal carina in front and a shallow groove on each side of the carina; mesopleuræ finely punctured; the depression at the base of the scutellum with three distinct longitudinal carinæ. Median segment rugose, the longitudinal carinæ not very distinct; the median enclosed area long and narrow, the marginal carinæ meeting at the base, diverging to the apex of the dorsal surface and converging again to the apex of the posterior slope; the sides of the segment finely punctured. Abdomen smooth and shining; first tergite twice as long as its apical breadth; second tergite without a transverse line.

*Hab.* Kuranda, N. Queensland (*Turner*), May to July.

*Disophrys diluta*, sp. n.

♀. Testacea; antennis, tibiis posticis apice tarsisque posticis nigris; alis subhyalinis, fascia mediana pallide fusca; venis fuscis, basi flavis, stigmate dimidio basali flavo, apice fusco.

Long. 8 mm.

♀. Very near *D. exornata*, the sculpture being identical on the head and thorax, but the median segment is less coarsely rugose and the longitudinal carinæ more distinct. The pale fuscous fascia of the fore wings is fairly broad and crosses the wing from the base of the stigma. The basal portion of both wings is very feebly tinted with yellow, the apical portion very feebly with fuscous.

*Hab.* Mackay, Queensland (*Turner*), January; Kuranda, Queensland (*Turner*), July 1913.

*Disophrys similipicta*, sp. n.

♀. Flavo-testacea; antennis, vertice, mesonoto, mesosterno, segmentis abdominalibus quarto sequentibusque, coxis posticis, tibiis tarsisque posticis nigris; alis dimidio basali flavis, dimidio apicali fuscis, anticis stigmate fasciæque magna subtriangulari sub stigmate flavis.

Long. 8-9 mm.

♀. Face finely and closely punctured; vertex shining, with minute scattered punctures; interantennal ridges rather

low; marginal carinæ of the frontal depression distinct. Mesonotum sparsely punctured; the median lobe with a distinct longitudinal carina in front extending to the middle, with a distinct groove on each side of the carina; the depression at the base of the scutellum with three longitudinal carinæ. Median segment rugulose, the enclosed median area broadly oval. Second dorsal segment with an ill-defined but distinct impressed transverse line.

*Hab.* Mackay, Queensland (*Turner*); Townsville, Queensland (*Dodd*).

*Disophrys nigropectus*, sp. n.

♀. Flavo-testacea; antennis, mesothorace, scutello, segmentis abdominalibus tertio sequentibusque, coxis intermediis posticisque, trochanteribus, femoribus posticis intermediisque, tibiis intermediis supra, tibiisque tarsisque posticis nigris; alis subhyalinis basi flavo apice fusco suffusis, costa nigra, stigmatibus fusco.

Long. 7 mm.

♀. Face smooth and shining; interantennal ridges low but distinct; the marginal carinæ of the frontal depression almost obsolete. Mesonotum smooth and shining, the middle lobe with a longitudinal carina reaching to the middle and a shallow groove on each side of the carina; the depression at the base of the scutellum smooth, without carinæ. Median segment coarsely rugulose; enclosed median area subtriangular, the sides diverging from the base to the apex of the dorsal surface; the apical slope without carinæ. First tergite scarcely half as long again as its apical breadth; second tergite without a transverse line.

*Hab.* Kuranda, N. Queensland (*Turner*), July 1913.

Approaches the genus *Euagathis* in the almost complete absence of frontal carinæ.

*Biróia solitaria*, sp. n.

♀. Rufo-testacea; antennis, articulis duobus basalibus exceptis, segmento mediano, angulis anticis exceptis, abdomine, pedibus posticis, valvulisque terebræ nigris; ventre basi albido; alis fuscis, linea curvata, irregulari sub stigmatibus hyalina.

♂. Femina similis; segmento mediano dimidio basali rufo-testaceo.

Long. 10 mm.; terebræ long. 6 mm.

♀. Face and vertex smooth and shining; two longitudinal ridges between the antennæ as in the genus *Disophrys*; marginal carinæ of the frontal depression distinct. Meso-

notum broadly triangular, narrowly rounded anteriorly, smooth and shining, without parapsidal furrows. Median segment with six longitudinal carinæ, which are almost parallel and are continued on the face of the posterior truncation, the spaces between the carinæ transversely striated. First tergite elongate-triangular in the female, triangular in the male, with a lateral groove on each side from the base to beyond the middle; second tergite with an impressed transverse line behind the middle. Second abscissa of the radius a little longer than the second transverse cubital nervure.

*Hab.* Mackay, Queensland (*Turner*), February and March.

This is the only Australian species of the genus known to me, and no others appear to have been described, though species of the genus appear to be fairly numerous in New Guinea. The four genera dealt with in this paper appear to be Malayan immigrants, and do not seem to occur in the southern portion of Australia.

#### XXIV.—*Four new Species of Hedgehog.*

By OLDFIELD THOMAS.

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##### *Æthechinus angolæ*, sp. n.

General characters of *Æ. frontalis*, but markedly smaller.

Colour of the type about as in average examples of *Æ. frontalis*; the dorsal spines tipped with whitish; the crown, cheeks, and throat white, the belly black. Dorsal spines about half whitish, then black, with a light tip. No dependence can, however, be placed on colour, as not only does *frontalis* vary enormously in this respect in single localities, but, from what Bocage says, the same is evidently true of *angolæ*. The spines of the back are 19–20 mm. in length, and those of the crown about 22 mm.

Skull essentially as in *frontalis*, but smaller. The marked longitudinal groove along the frontal suture, present in every one of fifteen skulls of *frontalis*, is not, however, perceptible in the type of *angolæ*. There is also much less distance at the sides of the nasals between the tips of the premaxillary and frontal processes than is usual in *frontalis*. The distance is only 2·2 mm. in *angolæ*, while it is commonly 5–6 mm. in *frontalis*. This is, however, a variable character in all hedgehogs.



Dimensions of the type :—

Hind foot (s. u.) 27·5 mm.; ear 26 (measured on spirit-specimen).

Skull: condylo-basal length 46; zygomatic breadth 28·7; nasals  $13 \times 2\cdot4$ ; interorbital breadth 14; intertemporal breadth 11·8; postglenoid breadth 21·3; palatal length 26·5; upper tooth-series 23·3; combined length of  $p^4$ ,  $m^1$ ,  $m^2$  11.

*Hab.* Benguella, Angola.

*Type.* Adult male with worn teeth (in spirit). B.M. no. 64.8.16.4. Collected and presented by F. F. Monteiro, Esq.

This hedgehog is that described by Dobson \* as *Erinaceus diadematus*, Fitz., but, as Anderson has shown, certainly cannot bear that name, which is a synonym of *Atelerix albiventris*. Further additional details about the type-specimen may, however, be found in Dobson's account.

Bocage's notice † of the Angolan hedgehog confirms its small size, for he speaks of an adult female with a hind foot only 25 mm. in length.

*Atelerix spinifex*, sp. n.

Near *A. spiculus*, but smaller.

External characters about as in *spiculus*, but with shorter foot. Ears whitish brown. Ends of spines drabby instead of white, but this may not be natural. Dorsal spines about 16–17 mm. in length, their basal and terminal thirds drabby, their middle third blackish.

Skull characterized by its small size, small brain-case, narrow conical muzzle, and widely and angularly expanded zygomata. No median groove on forehead.

Hind foot of type 24 mm.; ear (moistened) 23.

Skull: condylo-basal length 40; zygomatic breadth 25·8; nasals  $11 \times 2\cdot3$ ; interorbital breadth 12·8; intertemporal breadth 9·1; postglenoid breadth 20; palatal length 23; upper tooth-series 20·5; combined length of  $p^4$ ,  $m^1$ , and  $m^2$  9·3; breadth of  $m^1$  anteriorly 3·7.

*Hab.* of type. Illela, 95 miles north of Sokoto, Nigeria.

*Type.* Adult male with worn teeth. B.M. no. 4.1.14.1. Collected May 1903, and presented by Capt. P. S. Lelean. One specimen.

The Museum possesses now several further examples, presented by Messrs. Fox and Langslow-Cock, of the North

\* Mon. Insect. p. 10 (1882).

† J. Sci. Lisb. (2) i. p. 25 (1889).

Nigerian hedgehog, and these are all very uniform with the original series from near Lake Chad, having a skull-length of about 43 mm., comparatively broad muzzles and evenly expanded zygomata. The little specimen from north of Sokoto, a fully adult male, appears therefore to be worthy of specific separation. So far as I am aware, it is the smallest hedgehog in the world.

*Atelerix kilimanus*, sp. n.

Allied to *A. hindei*, but smaller.

Colour essentially as in *hindei*, with a number of the dorsal spines white-ended, while the majority have drabby ends with the *extreme* tip dark. Hairy parts of body white, the muzzle and feet dark brown. Spines of back about 19 mm. in length, dark at their absolute base, then with a 5-mm. white band, a rather longer blackish one, a 3-mm. sub-terminal one, and a dark extreme point.

Skull of quite the same general shape as that of *A. hindei*, broad, with comparatively short muzzle and evenly widely expanded zygomata; in *albiventris* the skull is narrower, the muzzle longer and more slender, and the zygomata less expanded. In *sotikæ* the nasals are of unusual length, and the species is perhaps more nearly allied to *albiventris*.

Dimensions of the type (measured in the flesh):—

Head and body 174 mm.; tail 15; hind foot 25·5; ear 25.

Skull: condylo-basal length 42; zygomatic breadth 28·3; nasals  $12\cdot7 \times 2\cdot6$ ; interorbital breadth 13·5; intertemporal breadth 10·8; postglenoid breadth 22·2; palatal length 24·7; upper tooth-row 20·2; combined length of  $p^1$ ,  $m^1$ , and  $m^2$  9·6.

*Hab.* Kilima-njaro. Type-series from Rombo, alt. 5300'.

*Type.* Adult female. B.M. no. 10.7.2.38. Original number 1138. Collected 9th June, 1910, by Robin Kemp; presented by C. D. Rudd, Esq. Fourteen specimens.

The Kilima-njaro hedgehog is distinctly smaller than that of Kitui, and may be distinguished even by the size of the molars, the breadth of  $m^1$  (anteriorly) being in *hindei* about 4·4 mm., while in *kilimanus* it is about a millimetre less. Both are readily distinguishable from *albiventris* by their broader and more rounded skulls.

*Paracchinus amir*, sp. n.

Size about as in *P. macracanthus*. Colour and other external characters very much as in that species, the head

and chin hoary grey, the limbs and belly greyish black. Ears large, greyish white. Spines commencing in front on a level with the hinder edge of the ears. Dorsal spines elongate, about 37 mm. where longest, their surface rough, as usual in this genus, the basal fourth or third white, succeeded by a darker band 3–5 mm. in breadth, the remaining portion half white, with the terminal half black. None of the spines have light tips, and the general colour is consequently blackish.

Skull without the peculiar elongate narrowness of those of *P. hypomelas* and *macracanthus*, the zygomata about as widely bowed in proportion to the size of the skull as they are in *P. blanfordi* and *grayi*; the frontal regions also broader, while the intertemporal "waist" is narrower and more strongly marked. Nasals less strongly narrowed and prolonged posteriorly. Mesopterygoid fossa wider in front, more narrowed behind. Pterygoids more inflated and more approaching the extreme type found in *P. æthiopicus*, the parapterygoid fossæ consequently very shallow. In *hypomelas* and *macracanthus* these fossæ are deeper and more normal than in other species of *Paraechinus*. Bullæ rather higher than in the allied species.

Teeth apparently quite as in *macracanthus*.

Dimensions of the typical skull—the skin having no measures recorded and being so made that none can be taken :—

Greatest (condylo-basal) length 52 mm.; basal length 49; zygomatic breadth 30·2; nasals  $16 \times 3\cdot6$ ; breadth across postorbital processes 15·5; intertemporal breadth 11·7; breadth across postglenoid processes 26·6; palatal length 27; breadth of mesopterygoid fossa 4·1; upper tooth-series 25; combined length of  $p^4$ ,  $m^1$ , and  $m^2$  12.

*Hab.* Kandahar, Afghanistan.

*Type.* Adult male. B.M. no. 81.8.16.3. Collected April 1881, and presented by Col. Chas. Swinhoe.

This specimen is that referred by Scully in 1881\* and again by Wroughton in 1910† to *Erinaceus macracanthus*, but it appears to me certainly distinct. It has not the peculiarly elongate non-constricted skull of that species, while the structure of its pterygoids, a most characteristic part in these animals, is more as in the other species of *Paraechinus*.

\* Ann. & Mag. N. H. (5) viii. p. 224 (1881).

† Journ. Bomb. N. H. Soc. xx. p. 82 (1910).

XXV.—*A new River-crab from the Transvaal.*

By W. T. CALMAN, D.Sc.

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A RIVER-CRAB recently sent for determination by Dr. E. Warren, of the Natal Museum, Pietermaritzburg, appears to be sufficiently interesting to merit brief description.

*Potamon (Potamonautes) warreni*, sp. n.

*Description*.—Resembling very closely *P. perlatum* (Milne-Edwards), but having the antero-lateral margin of the carapace armed with a series of about eight curved spiniform teeth. The first tooth stands at the end of the postfrontal ridge; the following teeth diminish in size (not quite regularly) from before backwards, passing into a line of granules that curves on to the dorsal surface. The surface of the carapace and limbs is rather smoother than in most specimens of *P. perlatum*, the postfrontal ridge, the margin of the front, and the upper margin of the orbit are nearly smooth, but the lower margin of the orbit is rather strongly toothed.

*Measurements*.—

	mm.
Length of carapace.....	50
Greatest breadth of carapace.....	70
Width of front between orbits.....	23.5
Walking-leg of second pair (not fully extended)..	85
Meropodite of second walking-leg .....	30 × 11

*Occurrence*.—"Potchefstroom, Dr. Cawston, December 1917." 1 ♀ carrying young (holotype). Brit. Mus.

*Remarks*.—It is possible that the specimen described above may only deserve to rank as a varietal form of *P. perlatum*, since it appears to differ from typical specimens of that species only in the armature of the antero-lateral margins of the carapace. This character, however, is so conspicuous, and has been accorded such importance in the classification of the family, that it seems advisable to call attention to it by a specific name.

I have examined, for the purpose of comparison, a considerable series of *P. perlatum* from various localities in South Africa, and in all the specimens the antero-lateral margins are either finely granular or minutely denticulate, the granules or denticles being not only very much smaller but also much more numerous than the conspicuous teeth of

the present species. Only in one instance is there anything suggestive of a transition from the one type to the other; this is in the case of three specimens from an unspecified locality in the Transvaal, in which the junction of the post-frontal ridge with the antero-lateral margin is produced in a small blunt tooth, behind which, however, the margin is only obscurely granulated.

On any of the current schemes of classification for the family Potamonidæ this species would be generically or subgenerically separated from *P. perlatum*. Its antero-lateral teeth are quite as well developed as in *P. niloticum* (M.-E.), the genotype of *Acanthothelphusa*, Ortmann. This name



*Potamon (Potamonantes) warreni*, sp. n., holotype.  
Outline of one-half of carapace from above.

was proposed for a subgenus of *Potamon*, afterwards merged in *Parathelphusa* by Miss Rathbun, accorded generic rank by Alcock, and now included as a subgenus of *Hydrothelphusa* by Bouvier (C. R. Acad. Sci. clxv. 1917, p. 620), owing its separation in each case mainly to these antero-lateral teeth. I believe, however, that *Acanthothelphusa* cannot be maintained—at all events, on the ground of this character alone. Just as *P. warreni* is intimately related to its geographical neighbour *P. perlatum*, so there is at least a hint that *P. niloticum* may be related, though less closely, to some of the river-crabs of East Africa. A comparison with *P. johnstoni*

(Miers), for example, shows a similarity in the disposition of the grooves of the carapace, particularly in the marked transverse branchial groove (or posterior branch of the cervical), which suggests that the nearest relatives of *P. niloticum* need not be sought for in distant parts even of the same continent.

If this be so, a similar argument applies with greater force to attempts that have been made to trace a connexion between the African Potamonidæ and those of the New World. Ortmann suggested that the South-American Pseudothelphusinae were linked to the Old-World river-crabs by this same *Acanthothelphusa nilotica*. This conclusion was disproved by Alcock, who showed that the affinities of the Pseudothelphusinae were with the Gecarcinucinae, a group which probably does not occur in Africa at all. Bouvier now suggests (C. R. Acad. Sci. clxv. 1917, pp. 617 & 753) that the African *Acanthothelphusa* (with *Erimetopus*) forms a transition to the other American subfamily, the Trichodactylinae. Here, again, the argument is greatly weakened if it can be shown that the essential characters of *Acanthothelphusa* have been acquired independently in different parts of Africa by various groups of *Potamonantes*; nor am I yet convinced, any more than were Ortmann or Alcock, that the Trichodactylinae are Potamonidæ at all.

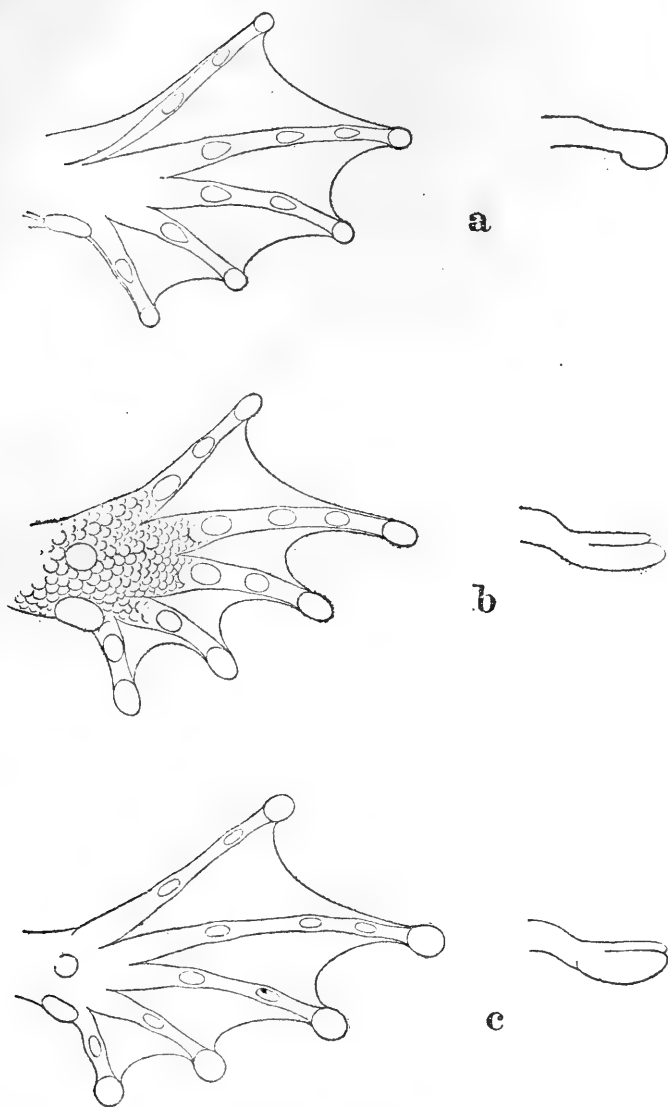
XXVI.—*On the Papuan, Melanesian, and North-Australian Species of the Genus Rana.* By G. A. BOULENGER, F.R.S.

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HAVING recently undertaken a much-needed revision of the south-easternmost representatives of the large genus *Rana*, I feel able, thanks to the extensive material accumulated in the British Museum since the publication of the 'Catalogue of Batrachians' in 1882, to offer for consideration new views on the delimitation of the species and on their synonymy, as well as an attempt at a better classification of them.

The species fall under three groups, which may be regarded as natural subgenera :—

1. *Rana*, s. str., represented by one species only, *R. grunniens*, Daud., a close ally of the widely distributed *R. macrodon*, D. & B., from which it differs in the absence of tooth-like processes in the lower jaw and in the shorter tibia.



- a. *Rana grunniens*.  
 b. — *bufoniformis*.  
 c. — *papua*.

Lower view of foot and enlarged side view of tip of fourth toe.

2. *Discodeles*, n. n., for three species from the Solomon Islands which differ from the preceding in the presence of a horseshoe-shaped groove on the terminal discs of the toes, or of the fingers also, which are thus divided into an upper and a lower portion, the latter forming a more or less adhesive pad, and in the web between the toes not penetrating far between the outer metatarsals\*.

3. *Hylorana*, Tschudi, agreeing with the preceding in the groove on the digital discs, but differing in the outer metatarsals being separated nearly to the base. Five species are referred to this subgenus†.

### SYNOPSIS OF THE SPECIES.

#### I. *Rana*.

Vomerine teeth behind the level of the choanæ, in long and strong oblique series; head a little broader than long; canthus rostralis very obtuse; tympanum  $\frac{1}{2}$  to  $\frac{2}{3}$  diameter of eye; first finger much longer than second; tibio-tarsal articulation reaching the eye; heels meeting when the limbs are folded at right angles to the body; tibia a little over 2 to  $2\frac{1}{3}$  times in length from snout to vent; toes with the tips dilated into small discs, webbed to the discs; no glandular dorso-lateral fold; nasal bones large and in contact with each other and with the frontoparietals; omosternum forked at the base; male without secondary sexual characters.

1. *R. grunniens*, Daud.

#### II. *Discodeles*.

Vomerine teeth behind the level of the choanæ, in short and strong series; tongue with an obtuse papilla in the middle; head broader than long; canthus rostralis obtuse; tympanum  $\frac{1}{3}$  to  $\frac{1}{2}$  diameter of eye; toes with the tips dilated into small discs; glandular dorso-lateral fold, if present, not confluent with the temporal; nasal bones large and in contact with each other and with the frontoparietals; omosternum forked at the base.

Vomerine teeth not extending outwards beyond the vertical of the inner edges of the choanæ; fingers without discs, first longer than second; tibio-tarsal articulation reaching the temple; heels meet or fail to meet; tibia  $2\frac{1}{3}$  times in length from snout to vent; toes  $\frac{2}{3}$  webbed;

\* Several other species, from India (*R. beddomii*, Blgr., *leithii*, Blgr., *semipalmata*, Blgr.), belong to this subgenus, which leads to *Cornufer*, Tschudi.

† *R. holsti*, Blgr., from the Loo Choo Islands, originally described as allied to *R. temporaria*, L., should be referred to *Hylorana*. On the genus *Babina*, Van Denburgh, which has been proposed for it, cf. C. R. Ac. Sci. Paris, clxv. 1917, p. 989.



- upper parts very warty; an interrupted dorso-lateral fold; belly granular; male unknown . . . . . 2. *R. bufoniformis*, Blgr.
- Vomerine teeth not extending outwards beyond the vertical of the inner edges of the choanæ; fingers without discs, first not or but slightly longer than second; tibio-tarsal articulation reaching the eye; heels meet or fail to meet; tibia  $2\frac{1}{6}$  to  $2\frac{2}{3}$  times in length from snout to vent; toes  $\frac{2}{3}$  to  $\frac{3}{4}$  webbed; upper parts smooth or warty; no dorso-lateral fold; belly feebly granular; male with internal vocal sacs . . . . . 3. *R. opisthodon*, Blgr.
- Vomerine teeth extending outwards beyond the vertical of the inner edges of the choanæ; fingers with the tips dilated into small discs, first longer than second; tibio-tarsal articulation reaching the eye or the tip of the snout; heels meet or feebly overlap; tibia  $1\frac{1}{5}$  to  $2\frac{1}{6}$  times in length from snout to vent; toes  $\frac{3}{4}$  to entirely webbed; skin smooth or feebly warty above, smooth beneath; no dorso-lateral fold; male with external vocal sacs. . . . 4. *R. guppyi*, Blgr.

### III. *Hylorana*.

- Vomerine teeth between the choanæ or extending beyond the level of their posterior borders, in oblique groups or short series; canthus rostralis strong; tympanum  $\frac{2}{3}$  to  $\frac{3}{4}$  diameter of eye; tips of fingers and toes dilated into well-developed discs; glandular dorso-lateral fold, if present, confluent with the supratemporal; nasal bones narrow, oblique, widely separated from each other and from the frontoparietals; ethmoid largely exposed above, extending to between the nasals; omosternum not forked at the base.
- A. No dorso-lateral glandular fold; head as long as broad or broader than long; discs of toes not larger than those of the fingers; outer metatarsal tubercle absent or rather indistinct; tibio-tarsal articulation reaching between eye and tip of snout, or slightly beyond; heels feebly overlapping; tibia  $1\frac{3}{4}$  to a little over 2 times in length from snout to vent; male with an external vocal sac on each side of the throat and a large oval gland on inner side of arm. . . . . 5. *R. arfaki*, A. B. Mey.
- B. A dorso-lateral glandular fold; head as long as broad or longer than broad; discs of toes larger than those of the fingers; outer metatarsal tubercle present, rarely indistinct.
- a. Male with a large external vocal sac on each side of throat and a large oval gland on inner side of arm.
- Tibio-tarsal articulation reaching beyond tip of snout; heels strongly overlapping; tibia  $1\frac{1}{2}$  to  $1\frac{3}{4}$  times in length from snout to vent . . . . . 6. *R. grisea*, v. Kamp.
- Tibio-tarsal articulation reaching eye or between eye and nostril; heels more or

less overlapping; tibia 2 or a little over  
2 times in length from snout to vent .. 7. *R. krefftii*, Blgr.

♂. Male with vocal sacs internal, exceptionally external but feebly  
developed; no gland on inner side of arm.

Tibio-tarsal articulation reaching nostril, tip  
of snout, or beyond; heels strongly over-  
lapping; tibia  $1\frac{1}{2}$  to  $1\frac{5}{7}$  times in length  
from snout to vent ..... 8. *R. papua*, Less.

Tibio-tarsal articulation reaching eye or be-  
tween eye and nostril; heels feebly over-  
lapping; tibia 2 to  $2\frac{1}{6}$  times in length  
from snout to vent ..... 9. *R. daemeli*, Sldr.

### SYNONYMY AND DISTRIBUTION.

#### 1. *Rana grunniens*.

*Rana grunniens*, Daud. Hist. Rain. Gren. Crap. p. 65, pl. xxi. (1803),  
and Hist. Rept. viii. p. 127 (1803); Dum. & Bibr. Erp. Gén. viii.  
p. 380 (1841); Günth. Cat. Batr. Sal. p. 10 (1858); Bouleng. Cat.  
Batr. Ecaud. p. 23 (1882), and Tr. Zool. Soc. xx. 1914, p. 249.

*Rana subsaltans*, Gravenh. Delic. Mus. Vratisl., Batr. p. 35, pl. vii.  
(1829).

*Rana hydromedusa* (Kuhl), Tschudi, Class. Batr. pp. 40, 80 (1838).

*Rana macrodon* (non D. & B.), van Kampen, Nova Guinea, ix., Zool.  
p. 458 (1913).

*Hab.* Java (?), Amboina (type), and Dutch New Guinea.

#### 2. *Rana bufoniformis*.

*Rana bufoniformis*, Bouleng. Proc. Zool. Soc. 1884, p. 210, and Tr.  
Zool. Soc. xii. 1886, p. 47, pl. viii.

*Hab.* Solomon Islands (Treasury [type] and Faro).

#### 3. *Rana opisthodon*.

*Rana opisthodon*, Bouleng. Proc. Zool. Soc. 1884, p. 211, and Tr. Zool.  
Soc. xii. 1886, p. 50, pl. x.

? *Rana ventricosus*, T. Vogt, Sitzb. Ges. Nat. Fr. Berl. 1912, p. 8.

*Hab.* Solomon Islands (Treasury and Faro).—*R. ventri-  
cosa*, which, according to the description, differs only in  
having the toes entirely webbed, is from Lambassa.

#### 4. *Rana guppyi*.

*Rana guppyi*, Bouleng. Proc. Zool. Soc. 1884, p. 211, and Tr. Zool.  
Soc. xii. 1886, p. 48, pl. ix.

*Hab.* Solomon Islands (Shortland [type], Faro, New  
Georgia, Guadalcanar, Rubiana, Isabel).

5. *Rana arfaki*.

*Rana arfaki*, A. B. Meyer, Mon. Berl. Ac. 1874, p. 138; van Kampen, Nova Guinea, v., Zool. p. 165 (1906), and ix., Zool. p. 36 (1909).

*Limnodytes arfaki*, part., Peters & Doria, Ann. Mus. Genova, xiii. 1878, p. 418.

*Rana macroscelis*, Bouleng. Ann. & Mag. Nat. Hist. (6) i. 1888, p. 345, and Ann. Mus. Genova, (2) xviii. 1898, p. 706; Roux, Abh. Senck. Ges. xxxiii. 1910, p. 226; Bouleng. Tr. Zool. Soc. xx. 1914, p. 249.

*Rana waigiensis*, van Kampen, Bijdr. Dierk. xix. 1913, p. 90, and Nova Guinea, ix., Zool. p. 459, pl. xi. fig. 2 (1913).

*Hab.* New Guinea (type), Waigeou, and Aru Islands.

6. *Rana grisea*.

*Rana grisea*, van Kampen, Nova Guinea, ix., Zool. p. 460, pl. xi. fig. 3 (1913); Bouleng. Tr. Zool. Soc. xx. 1914, p. 250.

? *Rana novæ-britanniæ*, part., Werner, Verh. zool.-bot. Ges. Wien, li. 1901, p. 614.

*Hab.* Dutch New Guinea (Went Mts., 4200 feet [type], and Utakwa R., 2500-3000 feet).

7. *Rana krefftii*.

*Hylorana erythræa*, part., Günth. Cat. Batr. Sal. p. 73 (1858).

*Rana krefftii*, Bouleng. Cat. Batr. Ecaud. p. 64, pl. iii. fig. 2 (1882), and Tr. Zool. Soc. xii. 1886, p. 52.

? *Rana novæ-britanniæ*, Werner, Zool. Anz. xvii. 1894, p. 155, and Mitth. Zool. Mus. Berl. i. 1900, p. 111, fig.

*Hab.* Solomon Islands (San Christoval [type], Santa Anna, Guadalcanar, Isabel).

Werner's description of *R. novæ-britanniæ*, from New Britain, applies well to this species, except for the size of the tympanum, stated to be nearly as large as the eye.

8. *Rana papua*.

*Rana papua*, Lesson, Voy. 'Coquille,' Zool. ii. p. 59, pl. vii. fig. 1 (1830); Boettg. in Semon, Zool. Forsch. p. 111 (1894); Mähely, Term. Füzet. Budapest, xx. 1897, p. 410; van Kampen, Nova Guinea, v., Zool. p. 164 (1906), ix., Zool. p. 37 (1909), and p. 459 (1913); Bouleng. Tr. Zool. Soc. xx. 1914, p. 250.

*Limnodytes waigiensis*, Dum. & Bibr. Erp. Gén. viii. p. 514 (1841).

*Limnodytes papuensis*, A. B. Mey. Mon. Berl. Ac. 1874, p. 52; Doria, Ann. Mus. Genova, vi. 1874, p. 356.

*Limnodytes papua*, Peters & Doria, Ann. Mus. Genova, xiii. 1878, p. 418.

*Limnodytes arfaki*, part., Peters & Doria, l. c. pl. vi. fig. 1.

*Rana papua*, part., Bouleng. Cat. Batr. Ecaud. p. 64 (1882); Roux, Abh. Senck. Ges. xxxiii. 1910, p. 224.

*Rana arfaki*, part., van Kampen, Bijdr. Dierk. xix. 1913, p. 90.

*Rana fallax*, van Kampen, Nova Guinea, ix., Zool. p. 459 (1913).

*Hab.* New Guinea and neighbouring islands (Waigeou [type], Aru, Kei, Timor Laut, Fergusson, Murray, &c.).

I am unable to express an opinion on the specimens from Jobi, referred to this species by Barbour, Mém. Mus. Comp. Zool. xlv. 1912, p. 65, pl. v. fig. 15, in which the male is provided with a humeral gland.

### 9. *Rana daemeli*.

*Hylorana erythræa*, part., Günth. Ann. & Mag. Nat. Hist. (3) xx. 1867, p. 56.

*Hylorana daemeli*, Steind. Sitzb. Ak. Wien, lvii. i. 1868, p. 532, pl. —.

*Hylarana nebulosa*, Macleay, Proc. Linn. Soc. N.S.W. ii. 1877, p. 137.

*Rana papua*, part., Bouleng. Cat. Batr. Ecaud. p. 64 (1882), and Ann. & Mag. Nat. Hist. (5) xvi. 1885, p. 387; Roux, Abh. Senck. Ges. xxxiii. 1910, p. 224.

*Hyla nobilis*, De Vis, Proc. R. Soc. Queensl. i. 1884, p. 129.

*Rana daemeli*, Garman, Bull. Mus. Comp. Zool. xxxix. 1901, p. 14; Bouleng. Tr. Zool. Soc. xx. 1914, p. 250.

*Rana novæ-guinæe*, van Kampen, Nova Guinea, ix., Zool. p. 37, pl. ii. fig. 5 (1909), and p. 459 (1913).

*Hab.* Northern Queensland (type) and New Guinea.

## XXVII.—*Some Notes on the small Sand-Foxes of North Africa.* By OLDFIELD THOMAS.

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WHILE attempting to determine a small fox from Nigeria presented some years ago to the National Museum by Mr. (now Sir John) Eaglesome, I have come upon certain points in the nomenclature and relationships of what Mr. de Winton \* has called the "sand-foxes" which it seems advisable to record for the saving of future trouble.

The species dealt with are three in number—namely, the widely distributed animal usually known as *Vulpes famelica*, the smaller *V. pallida* of the Egyptian Soudan, and the true Fenneec.

\* P. Z. S. 1899, p. 544.

With regard to the last-named, I have again studied the account given by Skiöldebrand\* of the animal he calls "*Vulpes minimus saarensis*," with a view to determining if that name would have to be adopted. For, if it would, very serious results might follow as to the generic name of the common foxes, owing to the fact that no earlier use is valid of the genus name *Vulpes*, of which the fennec would therefore be the type, to the exclusion of the common fox, usually called *Vulpes vulpes*. Palmer† has given the facts, but, owing to his accepting the earlier *Vulpes* of Frisch, now generally rejected, the importance of the status of Skiöldebrand's name does not appear.

But I think the latter may be rejected as being merely a Latin rendering of "small Saharan fox," for the author says he does not know which Linnean genus to put his animal into, as he has not been able to examine its teeth. He therefore, by his own showing, uses no generic name, but calls it by a combination which is not on the binomial system at all, and is polynomial and therefore invalid. Moreover, no *Vulpes minimus* existed, of which *saarensis* could have been taken as a varietal or subspecific addendum, as we are accustomed to do in the case of Kerr's and other early authors' trinomials. *Fennecus zerda*, Zimm., should therefore be the name of the fennec, thus leaving *Vulpes*, as a generic name, available for the true foxes, with *V. vulpes* as genotype.

Passing to the more fox-like species, the first name to be considered is Schinz's *Canis rüppelli*‡, of which Mr. de Winton says that it has been "generally referred" (I do not know by whom) to Rüppell's *Canis famelicus*, but that he "has no hesitation" in assigning it to *Canis pallidus*. I regret that in this conclusion I am quite unable to agree with him.

Schinz based his name on specimens sent by Rüppell from Dongola, in the Nubian desert, seen by him in the Frankfort Museum, so that the Cretzschmar descriptions of Rüppell's animals would include the type or co-types of *rüppelli*. Now from Cretzschmar's account it appears that *famelicus* was represented by seven specimens which had been obtained partly in the "nübischen Wüsten" (in which Dongola lies) and partly in Kordofan, quite a distinct locality, while the three examples of *pallidus* were all from Kordofan, the

\* K. Vet.-Ak. Handl. xxxviii. p. 265 (1777).

† Index Gen. Mamm. p. 708 (1904).

‡ Cuv. Thierr. iv., Supp. p. 508 (1825).

species not occurring further north. Thus Schinz's Dongola is only applicable to the *famelicus*.

Furthermore, while the description given of the colours is equally applicable to either, the statement "Schwanz länger als der Körper" is quite decisive of the question, for, while the tail is about the length of the body in *famelicus*, it is quite conspicuously shorter in *pallidus*, as is shown by Rüppell's measurements of the specimens described.

I feel, therefore, so sure of this conclusion that I propose to call the larger species, with long white-tipped tail, *Vulpes rüppelli*, in place of *V. famelica*, leaving *pallida* for the smaller species with short black-tipped tail.

And it would appear from de Winton that earlier authors have come to the same conclusion, although they have not seen the necessity of superseding *famelicus* by *rüppelli*. The Somali form of *rüppelli* is subspecifically distinguished below.

Next comes *V. dorsalis*, Gray, from Senegal, placed in this group by de Winton, who synonymizes Rochebrune's *V. edwardsi* with it.

The type of *dorsalis* is a mere puppy, but by extracting the germ of its first upper molar I am able to form a judgment as to where the species belongs. This tooth is no less than 10 mm. in antero-posterior length, which shows at once that the animal is not one of these small foxes at all, but would have attained the size of one of the large true foxes. It is therefore probably related to *V. nilotica* and *atlantica*. The corresponding measurement in *rüppelli* is rarely 8 mm., and in *pallida* 7-7.3 mm.

As a consequence, Rochebrune's *V. edwardsi* will be valid as a name for the small Senegal fox, which I believe to be a local subspecies of *V. pallida*; and I should provisionally refer the Nigerian fox to the same western subspecies.

The following seems worthy of a special subspecific name:—

*Vulpes rüppelli somaliæ*, subsp. n.

Size and other essential characters as in true *rüppelli*, but the back greyer, the median dorsal line less prominent and less strongly ochraceous, while the area on each side of it is more definitely grey—even blue-grey. Fur rather shorter and coarser, without the extreme softness characteristic of the Egyptian animal.

Dimensions of type (measured in the flesh):—

Head and body 445 mm.; tail 345; hind foot 120; ear 100.

Skull : greatest length 109 ; condylo-basal length 106 ; front of canine to back of  $m^2$  49.5 ; antero-posterior diameter of  $m^1$  externally 7.

*Hab.* N. Somaliland. Type from near Berbera.

*Type.* Adult female. B.M. no. 97. 8. 9. 10. Original number 1. Collected 3rd December, 1896, and presented by Dr. A. E. Atkinson. Five specimens examined.

There is always much variability in the colour of these foxes, but the harsher fur, the increase in the grey of the sides of the back, and the decrease of the ochraceous along the spine are so generally characteristic of the Somali specimens in comparison with the Egyptian as to make a subspecific name for the former advisable.

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XXVIII.—*Platymycterus*, a new Genus of Asiatic Curculionidæ (Coleopt.). By GUY A. K. MARSHALL, D.Sc.

THE genus *Corigetus*, Desbr.,\* belongs to Lacordaire's group *Cyphicerides*, and, as defined by Faust (Stett. Ent. Zeit. 1890, p. 67), comprises a number of Oriental species. As it stands at present, it obviously contains various discordant elements, and will no doubt eventually be broken up into several genera. It is here proposed to separate off from it a small and homogeneous group of species that are related to *Corigetus fææ*, Fst., a native of Burma and Assam.

PLATYMYCTERUS, gen. nov.

Rostrum broad, almost flat above and lying in the same plane with the forehead, the sides straight or only slightly dilated at the apex ; the scrobes short, apical and completely dorsal in position, subtriangular, broadly and abruptly delimited behind, the basal width almost equal to the length, and the space between them equal to or less than half the width of the forehead ; the process forming the covering of the antennal socket convex, bare and shiny, appearing almost as if it were the actual condyle of the antenna ; the epistome short, deeply and angularly emarginate in front, its hind margin forming a low rounded ridge, not sharply carinate, the angle being a right angle or less and ending a little

\* Desbrochers, 'Abeille,' xi. 1873, p. 746 (1874) ; Faust, Deut. Ent. Zeit. 1885, p. 167 ; Reitter, Deut. Ent. Zeit. 1900, p. 62.

behind the middle of the scrobes ; mandibles each bearing three setæ ; mentum with two long and four shorter setæ. Prothorax strongly narrowed from base to apex, the sides almost straight or but slightly rounded, not constricted at the base or apex, the base very deeply bisinuate ; the post-ocular lobes very feeble or obsolete, with a fringe of short vibrissæ ; the front coxæ only slightly nearer to the front margin of the prosternum than to the hind. Elytra with very oblique shoulders ; insects winged. Corbels of hind tibiæ entirely open and without any internal carina.

In addition to the genotype, *P. fœæ*, Fst., three other previously described species must be included in this genus, namely, *Corigetus armiger*, Fst., *C. turkestanicus*, Fst., and *Platytrachelus marmoratus*, Fst. (*Corigetus kirghisicus*, Fst.), all from Central Asia.

*Corigetus* (sens. str.) was founded on a Siberian species, *C. marmoratus*, Desbr., and will probably prove to be a purely Palearctic genus. From *Platymycterus* it differs principally in the structure of the rostrum. The scrobes are not so entirely dorsal in position, being linear (more than twice as long as broad), extending for fully half the length of the rostrum and becoming gradually shallower behind, without any abrupt transverse delimitation ; the upper edge of the scrobe is carinate and curves round to the middle of its base, thence running back towards the middle of the front margin of the eye ; the scrobes are widely separated, the space between them being four-fifths the width of the forehead ; the hind margin of the epistome is sharply carinate ; the mentum bears only four setæ ; the upper surface of the rostrum is strongly raised behind and stands high above the depressed and flattened forehead ; the prothorax is not subconical, the sides being rounded and constricted near the base and apex.

In *Cyrtepestomus*, Mshl. (Ann. & Mag. Nat. Hist. (8) xii. 1913, p. 186), and *Cyphicerus*, Schh., the scrobes are ill-defined posteriorly ; the prothorax is not or only slightly narrower at the apex than at the base, the basal margin being subtruncate or very shallowly bisinuate ; in the former genus the mentum bears four setæ, in the latter it bears only two and the corbels of the hind tibiæ contain a well-marked carina.

The following is a key to the species at present known to me :—

- 1 ( 6). Joint 2 of funicle longer than 1.
- 2 ( 5). Colour green below and brown or grey  
above, with a green patch round the



scutellum; the faint transverse carina on the rostrum that limits the interscrobal area behind straight or only slightly angulated.

- 3 (4). The carina and furrows on the rostrum well developed; the shoulders of the elytra obtusely angulated and prominent; the spiculum of the male genitalia very slender, no thicker than the struts of the median lobe..... *fea*, Fst.
- 4 (3). The furrows on the rostrum very shallow and the carinæ much reduced; the shoulders rounded and much less prominent; the spiculum stout, nearly three times as broad as the struts.... *deceptor*, sp. n.
- 5 (2). Colour uniformly green; the transverse carina on the rostrum strongly angulated and the furrows deep..... *himalayanus*, sp. n.
- 6 (1). Joint 2 of funicle equal to or a little shorter than 1.
- 7 (12). The scaling on the intervals of the elytra broken up by irregular bare transverse lines.
- 8 (9). The distance between the two discal carinæ on the rostrum at the base but little greater than the space between each carina and the eye nearest to it, the central carina indistinct and hidden by scales; striæ on the elytra quite straight and regular..... *marmoratus*, Fst.
- 9 (8). The distance between the carinæ at least twice as great as that between each carina and the adjacent eye; the central carina distinct and bare; some of the striæ on the elytra rather wavy or irregular.
- 10 (11). Rostrum evidently shorter than its basal width and slightly widened at the apex..... *armiger*, Fst.
- 11 (10). Rostrum almost as long as its basal width, gradually narrowed from base to apex, its sides quite straight..... *turkestanicus*, Fst.
- 12 (7). Scaling on intervals of elytra continuous.
- 13 (14). Colouring grey or brown; shoulders prominent, the humeral slope forming a well-marked angle with the side of the prothorax..... *mæstus*, sp. n.
- 14 (13). Colouring uniform metallic green; shoulders reduced, the humeral slope forming almost a continuous line with the side of the prothorax.
- 15 (16). Punctures in the striae of the elytra very fine and close; apical spines of tibiae pale; the two basal joints of the funicle equal..... *kashmirensis*, sp. n.
- 16 (15). Punctures on the elytra rather widely spaced; apical spines of tibiae dark; joint 1 of funicle a little longer than 2. *sjöstedti*, sp. n.

1. *Platymycterus feæ*, Fst.

*Corigetus feæ*, Fst. Ann. Mus. Civ. Genova, xxxiv. 1894, p. 201 (1895).

BURMA; ASSAM.

2. *Platymycterus deceptor*, sp. n.

♂. Black, the upper surface covered with dense brownish-grey scaling, except for a small spot of metallic green on and round the scutellum; the lower parts and the apex of the elytra entirely metallic green, that colour extending up to the 6th stria on the basal half of the elytra, and as far as the 4th on the upper part of the declivity; the prothorax with a narrow bare central line, and an indistinct broader thinly-scaled stripe on each side; legs with grey scales having a coppery reflexion.

*Head* with a very shallow transverse impression across the forehead; the central fovea deep and the rostral carina continued distinctly up to it. *Rostrum* about as long as broad, its sides almost straight and parallel, the space between the scrobe and the eye much longer than the scrobe, the upper surface with the central carina low and bare throughout, the furrows very shallow, the two discal carinæ feeble, strongly divergent behind and running almost to the inner margin of the eye, the anterior transverse carina evanescent. *Antennæ* with the joint 2 of the funicle about one-fourth longer than 1. *Prothorax* as long as its width at the apex, gently convex longitudinally, slightly rounded at the sides, with deep separated punctures and a narrow impunctate central line in the basal half. *Elytra* with the shoulders reduced and very obliquely rounded; the punctures in the dorsal striæ deep and closely set, but diminishing behind, those in the lateral striæ smaller and more widely separated, each puncture containing a minute recumbent seta; a shallow transverse impression across the base, the intervals almost flat, much broader than the striæ, and each with a row of short scale-like recumbent setæ.

The 8th abdominal tergite of the ♂ with the sculptured dorsal area transversely impressed and bounded in front by a distinct dark carina; the apical excavation very deep, both its upper and lower edges deeply sinuate. The ædeagus with a very long narrow cylindrical sac, which in repose is folded twice on itself and is one-third longer than the struts of the median lobe, only the terminal half being closely set with minute spines; the spiculum is very stout, being nearly

three times as thick as the median struts, while the stalk of the tegmen is about as broad as the broadest part of the latter.

Length  $5\frac{1}{2}$  mm., breadth  $2\frac{1}{2}$  mm.

INDIA: W. Almora Division, Kumaon, vii. 1917 (*H. G. Champion*).

Extremely similar to *P. feæ*, which it quite resembles in form and colour; but, apart from the characters mentioned in the key, that species differs in the following respects:—The forehead is simply flattened and not impressed, and the central carina of the rostrum does not extend on to it; the eyes are slightly less convex; the prothorax is rather narrower in front, so that the length is greater than the apical width, and the bare central line is more rugosely punctate; the punctures on the elytra are rather larger and less closely set; the 8th abdominal tergite of the ♂ has no transverse impression or carina; the cylindrical sac of the ædeagus is not longer than the much more slender median struts, and is clothed with spines for four-fifths of its length beyond the median lobe; the external angles at the apex of the median lobe are more obtuse, and the central process is more blunt.

### 3. *Platymycterus himalayensis*, sp. n.

♂ ♀. Extremely similar in structure to the two foregoing species, but readily distinguished superficially by the uniform green colouring of the whole body.

In *P. feæ* the eyes are almost as broadly rounded behind as in front, and the wrinkles on the sides of the rostrum are quite longitudinal, whereas in the present species the eyes are markedly narrower behind and the wrinkles on the rostrum are distinctly oblique. It differs also in having the sulci of the rostrum noticeably deeper, and the transverse carina behind the interscrobial area is strongly angulated; the punctures on the prothorax are less numerous, and the postocular lobes are a little more evident. In the 8th abdominal tergite of the ♂ the upper edge of the apical excavation forms a much more obtuse granulate ridge, which is much less deeply sinuated. In the male genitalia the spiculum is very stout (as in *P. deceptor*); the uneverted sac extends for about one-third its length beyond the struts of the median lobe and is broadly inflated at about two-thirds its length, thence tapering rapidly to the apex; the clothing of spines is confined mainly to the distal half and a patch close to the median lobe.

Length  $6\frac{1}{2}$  mm., breadth 3 mm.

INDIA: Kulu, Punjab.

4. *Platymycterus marmoratus*, Fst.

*Platytrachelus marmoratus*, Fst. Hor. Soc. Ent. Ross. xvi. 1882, p. 303.

*Corigetus khirgisicus*, Fst. Deut. Ent. Zeit. 1885, p. 170.

TRANSCASPIA.

5. *Platymycterus armiger*, Fst.

*Corigetus armiger*, Fst. Deut. Ent. Zeit. 1885, p. 173.

E. BOKHARA.

6. *Platymycterus turkestanicus*, Fst.

*Corigetus turkestanicus*, Fst. Deut. Ent. Zeit. 1885, p. 174.

7. *Platymycterus mæstus*, sp. n.

♀. Colour black, with dense sandy grey or brownish scaling above and below. Sometimes with a faint pinkish metallic reflexion; three very indistinct darker stripes on the prothorax.

*Head* with the eyes much flatter than in any other species. *Rostrum* as long as broad, the sides straight and almost parallel, the scrobe evidently shorter than the space between it and the eye, the dorsal sulci moderately deep, the two discal carinae only slightly diverging behind, the base of each being a little nearer to the eye than to the central carina, the lateral area in front of the eye longitudinally wrinkled. *Antennae* with the two basal joints of the funicle equal. *Prothorax* with the sides straight from the base for four-fifths the length, then slightly curved in at the apex, the apical width about equal to the length of the side, the basal margin not quite so deeply sinuate as in *P. fææ* and the postocular lobe distinctly more pronounced; the punctation closer, but partly concealed by the very dense scaling, with a rounded impression on each side behind the middle and no denuded central line, the longitudinal outline almost flat. *Elytra* with well-marked angulate shoulders, the humeral slope forming a strong angle with the side of the prothorax; the punctures in the striae narrow and elongate, each containing a minute recumbent seta, striae 5 and 6 almost or quite uniting at the base; the intervals gently convex, with short recumbent scale-like setae,

Length 6-7 mm., breadth  $2\frac{3}{4}$ -3 mm.

INDIA (no exact locality).

8. *Platymycterus kashmirensis*, sp. n.

♀. Colour black, with uniform metallic-green scaling above and below.

Like a very small specimen of *P. himalayensis*, but differing as follows:—The eyes almost equally rounded in front and behind; the discal carinæ on the rostrum subparallel and no trace of a transverse carina; the antennæ with the two basal joints of the funicle equal, and the scape clothed only with hair-like scales; the prothorax more transverse, the apical width being slightly greater than the length of the side, the apical margin distinctly sinuate in the middle, the basal sinuations less deep, the upper surface more closely punctate and with a small rounded impression on each side behind the middle; the elytra with the shoulders less prominent, the striæ very closely and finely punctate, stria 6 ceasing at some distance from the base, the intervals almost flat.

Length  $3\frac{3}{4}$ –5 mm., breadth  $1\frac{7}{8}$ – $2\frac{1}{2}$  mm.

KASHMIR: Sonamarg, 8000 feet (*T. R. D. Bell*).

9. *Platymycterus sjöstedti*, sp. n.

♂ ♀. Colour dark piceous, with dense metallic-green scaling above and below; the head and legs generally pinkish, and sometimes there is a flush of the same colour on the disc of the elytra.

*Head* with forehead much broader than in any other species, the frontal width being twice as great as the length of the eye. *Rostrum* a little broader than long, somewhat dilated anteriorly, the genæ being rounded, the space between the eye and the hind margin of the scrobe only slightly longer than the scrobe itself, the dorsal area impressed, its lateral carinæ subparallel or slightly divergent behind, the lateral area with deep oblique wrinkles in front of the eye. *Antennæ* with joint 1 of the funicle slightly longer than 2. *Prothorax* broader than long, strongly narrowed from base to apex, the sides almost straight, the upper surface with numerous separated punctures plainly visible through the scaling and a faint fovea on each side behind the middle, without any trace of a central carina. *Elytra* with the shoulders very much reduced, the sides subparallel from there to beyond the middle, the apices slightly divergent, the striæ with narrow elongate separated punctures which

scarcely diminish behind, the suture slightly elevated behind, and the posterior declivity steep.

Length  $5\frac{1}{2}$ – $6\frac{1}{4}$  mm., breadth  $2\frac{1}{2}$ –3 mm.

INDIA: Dehra Dun, United Provinces (*Ollenbach*); Pusa (Pusa Coll.); and Chota Nagpur, Bengal (*Cardon*).

Dedicated to Prof. Dr. Yngve Sjöstedt, of Stockholm, to whom I have been indebted for the loan of numerous types in the past.

XXIX. — *Descriptions of New Pyralidæ of the Subfamily Pyraustinae.* By Sir GEORGE F. HAMPSON, Bart., F.Z.S., &c.

[Continued from p. 136.]

(33 b) *Lamprosema inglorialis*, sp. n.

Head, thorax, and abdomen pale grey-brown; palpi blackish, whitish in front towards base and the 3rd joint whitish; pectus, legs, and ventral surface of abdomen white tinged with brown. Fore wing pale grey-brown faintly tinged with reddish and irrorated with darker brown; an indistinct curved dark antemedial line; a narrow blackish discoidal lunule; a slight dark terminal line; cilia grey-brown with a fine whitish line at base. Hind wing pale grey-brown faintly tinged with reddish and irrorated with darker brown; a slight dark terminal line; cilia pale grey-brown with a fine whitish line at base; the underside white tinged with brown.

*Hab.* CAMEROONS, Ja R., Bitje (*Bates*), 1 ♂, 1 ♀ type. *Exp.* 26 mm.

(38 a) *Lamprosema hottentota*, n. n.

*Nacoleia fusalis*, Hmps. A. M. N. H. (8) ix. p. 442 (1912); nec *Thysanodesma fusalis*, Warr. A. M. N. H. (6) xvii. p. 142 (1896).

*Hab.* CAPE COLONY.

(40 a) *Lamprosema svezeyi*, n. n.

*Omiodes meyricki*, Svezey, Honolulu Sugar Planters' Bull. v. p. 24, fig. (Aug. 1907); nec *Merotoma meyricki*, Swinh. (Jan. 1907).

*Hab.* HAWAII.

(46 a) *Lamprosema lateritialis*, sp. n.

Head, thorax, and abdomen yellow tinged with rufous; palpi white in front at base; pectus, legs, and ventral surface of abdomen

white tinged with fulvous yellow. Fore wing fulvous yellow, the inner half tinged with brown, the terminal half suffused with grey-brown; antemedial line rather diffused, brown, oblique, arising below the costa; a small brown spot in upper part of middle of cell and discoidal bar; postmedial line rather diffused brown defined on outer side by yellowish, excurved to above vein 2, then retracted to lower angle of cell and excurved above inner margin; cilia whitish at tips. Hind wing fulvous yellow tinged with brown, the costal area white to beyond middle, the inner area whitish, the terminal area suffused with brown except towards tornus; an oblique brown discoidal bar; postmedial line rather diffused brown, arising below costa, oblique to above vein 2, then retracted to lower angle of cell, then oblique to submedian fold where it terminates; cilia whitish at tips.

Ab. 1. More suffused with brown; fore wing with the costal area yellowish, narrowing to the costal edge towards base.

*Hab.* BR. C. AFRICA, Mt. Mlanje (*Neave*), 5 ♂, 5 ♀ type. *Exp.* 26–30 mm.

*Pupæ* in colonies in silken cocoons in rolled up leaves.

(57 b) *Lamprosema chrysanthalis*, sp. n.

Head, thorax, and abdomen dark brown mixed with some greyish, the last with yellow dorsal patches except at base and extremity; antennæ ringed with yellow; palpi yellow at base and with yellow ring at extremity of 2nd joint; pectus, legs, and ventral surface of abdomen pale yellowish white, the fore tibiæ with black-brown bands at base and extremity. Fore wing golden yellow; the basal area dark brown mixed with some greyish; small obliquely placed yellow subbasal spots in and below the cell; antemedial line black-brown with some yellow before and beyond it on the costa and defined on inner side by yellow below the cell, excurved to median nervure and above inner margin and incurved in submedian interspace; the medial area with some dark brown suffusion below costa conjoined to a large black-brown discoidal spot filled in with leaden grey and with its upper extremity produced and a spot beyond its lower extremity; postmedial line black-brown, incurved below costa, then waved to vein 5, then excurved to vein 2 on which it is retracted to below end of cell, angled outwards at submedian fold and oblique to inner margin; the terminal area with a large irregular black-brown patch from costa to vein 4, its inner edge dentate to the postmedial line beyond which it encloses yellow spots, its outer edge incurved and enclosing a yellow patch on termen between veins 7 and 5, a short subterminal streak on vein 3 and a bar from the postmedial line at vein 2 to inner margin; a terminal series of black-brown bars; cilia intersected by black-brown bars at and below apex, at veins 4 and 3, and with spots at base at veins 2 and 1. Hind wing golden yellow; a black-brown discoidal

spot and spot at middle of inner margin; a diffused spot beyond lower angle of cell conjoined to the black-brown postmedial line, which is excurved below costa, bent inwards between veins 6 and 5, excurved to vein 2 where it is retracted with an upwards curve to below end of cell, excurved at submedian fold and ending at vein 1 above a black-brown patch irrorated with greyish rather beyond it on the inner margin and cilia; a black-brown subterminal band from costa to vein 5, above which it expands into a patch, then oblique to termen at vein 4; a curved mark from vein 2 before termen to termen at vein 1, its outer edge rather dentate; a rather lunulate black-brown terminal line, reduced to spots towards apex; cilia with a series of small black-brown spots at base, intersecting them at veins 4 to 2.

Ab. 1. Head and thorax red-brown mixed with some whitish; abdomen yellow suffused with red-brown and with dark segmental lines; fore wing with the markings red-brown, the basal inner area only red-brown at base, the antemedial line excurved below median nervure, the discoidal spot with hardly a tinge of grey on it, the subterminal patch on apical half not dentate to the postmedial line; hind wing with the markings red-brown.

*Hab.* CAMEROONS, Ja R., Bitje (*Bates*), 6 ♂, 2 ♀ type. *Exp.*, ♂ 28-30, ♀ 38 mm.

(59 a) *Lamprosema flavizonalis*, sp. n.

♀. Head, thorax, and abdomen dark reddish brown, the head with some yellow on vertex, the two basal segments of abdomen golden yellow; palpi white towards base; pectus, legs, and ventral surface of abdomen yellowish white. Fore wing glossy dark reddish brown with a very broad golden yellow postmedial band, its inner edge bent inwards at inner margin to near the antemedial line; the antemedial line black-brown defined on inner side by a narrow yellow band, from subcostal nervure to inner margin; a diffused yellow spot in end of cell. Hind wing golden yellow; some brown at base; the terminal area glossy dark reddish brown, its inner edge incurved below discal fold and with dark point before it on vein 1; cilia white and brown.

*Hab.* DUTCH N. GUINEA, Fak-fak (*Pratt*), 1 ♀ type. *Exp.* 30 mm.

(70 c) *Lamprosema cervinicosta*, sp. n.

Head white tinged with rufous, the frons browner, the palpi rufous; thorax and abdomen pure white; fore tibiae grey-brown at base and extremity. Fore wing silvery white; the costal area pale grey-brown, leaving the costal edge white on medial area; the terminal area pale grey-brown narrowing to a point at tornus; antemedial line slight, brown and curved from the costal area to



vein 1; a small dark brown discoidal lunule; postmedial line grey-brown, bent outwards between veins 5 and 2, then almost obsolete and retracted to lower angle of cell, then slight and obliquely excurved to vein 1; cilia pale reddish brown with a fine whitish line at base. Hind wing silvery white; a slight grey-brown discoidal bar; postmedial line grey-brown, bent outwards between veins 5 and 2, then almost obsolete and retracted to below angle of cell and faint to vein 1; a rather diffused grey-brown terminal line except towards tornus.

*Hab.* COLOMBIA, Choko, Juntas of R. Tamana and R. San Juan (*Palmer*), 1 ♂ type, R. Tamana, El Tigre (*Palmer*), 1 ♀. *Exp.*, ♂ 32, ♀ 28 mm.

(70d) *Lamprosema griseicosta*, sp. n.

♂. Head white tinged with rufous; thorax silvery white with black-brown bars on the shoulders; abdomen white tinged with rufous; palpi black-brown, white tinged with rufous in front, the 3rd joint whitish; pectus, legs, and ventral surface of abdomen whiter, the fore tibiæ with grey-brown band at extremity. Fore wing silvery white, the costal area grey-brown; a faint brown antemedial line from cell to vein 1; a curved dark brown discoidal striga; postmedial line slight, grey-brown with a blackish bar at costa, slightly angled inwards at vein 7, bent outwards and waved from vein 5 to below vein 3, then retracted to below angle of cell and excurved at submedian fold; a grey-brown terminal line. Hind wing silvery white; a pale grey-brown postmedial line, bent outwards and slightly waved from vein 5 to below vein 3, then retracted to below angle of cell and oblique to above tornus; a grey-brown terminal line except towards tornus.

*Hab.* PERU, Carabaya, Oconeque (*Ockenden*), 2 ♂ type, San Domingo (*Ockenden*), 1 ♂. *Exp.* 26–28 mm.

(70f) *Lamprosema rufilinealis*, sp. n.

♂. Head, thorax, and abdomen white tinged with rufous, the last with the anal segment black except the extremity of the anal tuft; palpi dark brown, white in front and with the extremity of the 3rd joint white; pectus, legs, and ventral surface of abdomen white, the fore tibiæ with dark band at extremity. Fore wing white, the costal area narrowly and the terminal area broadly pale brownish rufous; antemedial line brown tinged with rufous, erect; a brown discoidal bar tinged with rufous; postmedial line brown tinged with rufous, slightly bent outwards between veins 5 and 3, then bent inwards to lower angle of cell and erect to inner margin; cilia reddish brown and whitish with a whitish line at base. Hind wing white, the terminal area pale brownish rufous, broadly at

costa, narrowing to tornus; a reddish brown discoidal bar; post-medial line reddish brown, at vein 3 retracted and almost obsolete to lower angle of cell, then oblique to tornus; a dark brown terminal line; cilia whitish at base, with dark brown line at middle and white tips.

*Hab.* ECUADOR, Zamora, 1 ♂ type. *Exp.* 28 mm.

(70 h) *Lamprosema monocampalis*, sp. n.

♂. Head, thorax, and abdomen silvery white faintly tinged in parts with pale red-brown, the last with black-brown band before the anal tuft on which there are lateral black-brown streaks; palpi pale red-brown, white at base; fore tibiae with brown band near extremity. Fore wing silvery white faintly tinged with pale red-brown, the costal area pale red-brown leaving the costal edge white on medial area; antemedial line red-brown, erect and almost straight; a red-brown discoidal bar; postmedial line red-brown, slightly bent outwards from vein 5 to above 2, then retracted and almost obsolete to lower angle of cell, then erect to inner margin; a rather diffused red-brown terminal line; cilia white tinged with red-brown and with red-brown line near base. Hind wing white faintly tinged with pale red-brown; a red-brown discoidal bar; postmedial line red-brown, almost straight to vein 2, then retracted and almost obsolete to lower angle of cell and oblique to tornus; a pale red-brown subterminal shade; a fine red-brown terminal line; cilia white tinged with red-brown at base and tips and with darker brown line near base.

*Hab.* COLOMBIA, Minca (*H. H. Smith*), 2 ♂ type, Don Amo (*H. H. Smith*), 2 ♂. *Exp.* 24-28 mm.

(73 a) *Lamprosema leuconephralis*, sp. n.

♀. Head white suffused with pale red-brown; thorax and abdomen silvery white; sides of frons and palpi black-brown, the latter silvery white below; pectus, legs, and ventral surface of abdomen white faintly tinged with pale red-brown; fore tibiae suffused with black-brown above. Fore wing silvery white, the costal area pale red-brown; antemedial line pale red-brown, from cell to inner margin; a small pale red-brown annulus in upper part of middle of cell; reniform white defined by pale red-brown; postmedial line pale red-brown, somewhat bent outwards and very slightly waved between veins 5 and 2, then retracted and obsolescent to lower angle of cell and slightly sinuous to inner margin; a diffused very pale red-brown patch on terminal area below apex, then a very pale red-brown terminal line; cilia white tinged with pale red-brown. Hind wing silvery white; a faint pale red-brown discoidal bar; postmedial line pale red-brown, slightly excurved at vein 5, then oblique and slightly sinuous to vein 2 near termen, then retracted and obsolescent to lower angle of cell and oblique to tornus; a

rather diffused pale red-brown terminal line and the cilia tinged with pale red-brown except towards tornus.

*Hab.* COLOMBIA, Choko, R. Siato, 1 ♀ type. *Exp.* 20 mm.

(78 a) *Lamprosema furcirenalis*, sp. n.

♀. Head, thorax, and abdomen whitish suffused with pale red-brown, the tegulæ dorsally and shoulders with black-brown stripes, the abdomen with small black subdorsal spots on 2nd segment; palpi white, the 2nd joint above and 3rd joint dark brown; pectus, legs, and ventral surface of abdomen white tinged with pale red-brown, the terminal half of fore tibiæ black. Fore wing whitish suffused with pale red-brown, the costal area dark reddish brown to end of cell; a minute black spot at base of vein 1; a red-brown subbasal bar from the costal area to submedian fold and a small black spot at inner margin; antemedial line black-brown, oblique to discal fold, then erect and slightly sinuous; a black-brown annulus in middle of cell and two discoidal bars approximated below; postmedial line black-brown, incurved from below costa to vein 5, then excurved to vein 2 where it is retracted to below angle of cell and oblique to inner margin; the terminal area suffused with red-brown to vein 4 and with slight red-brown shade from the postmedial line at vein 2 to inner margin; a black-brown terminal line. Hind wing whitish suffused with pale red-brown; a V-shaped black-brown discoidal mark with an oblique black-brown line from it to just above inner margin near tornus; postmedial line black-brown, slightly bent outwards at vein 5 and diffused from submedian fold to above tornus; a subterminal dark brown shade from below costa to vein 4; a black-brown terminal line.

*Hab.* CAPE COLONY, Bedford (*Mansell-Weale*), 1 ♀ type. *Exp.* 20 mm.

(85 b) *Lamprosema truncitornalis*, sp. n.

♂. Head, thorax, and abdomen yellow tinged with red-brown and slightly irrorated with fuscous; antennæ ringed with black; frons at side and palpi black-brown, the latter with the basal half white; pectus, legs, and ventral surface of abdomen white faintly tinged with rufous, the fore tibiæ and tarsi banded black and white. Fore wing yellow tinged with red-brown and irrorated with fuscous; some black on base of costa, some spots on terminal half of costa, and a subbasal spot below costa; antemedial line blackish, waved; a blackish annulus in middle of cell; reniform defined by black except below, its lower extremity produced with some blackish irroration below it; postmedial line blackish, incurved at discal fold, excurved between veins 5 and 2, then retracted to below angle of cell and excurved to inner margin; a slight subterminal blackish shade from costa to vein 5; a terminal black line, a line

near base of cilia and the tips of cilia blackish to vein 4. Hind wing with the tornus truncate; yellow tinged with red-brown and irrorated with fuscous; a rather diffused blackish antemedial line arising at upper angle of cell; postmedial line blackish, excurved between veins 5 and 2 and diffused towards tornus; a blackish subterminal shade from costa to vein 3; a black terminal line and line near base of cilia from apex to vein 2.

*Hab.* QUEENSLAND, Brisbane, Taylor Range (*Dodd*), 1 ♂ type. *Exp.* 14 mm.

(94 b) *Lamprosema strigivenalis*, sp. n.

♂. Head and thorax whitish tinged with ochreous and fuscous, the patagia with black streak; abdomen whitish suffused with fuscous, leaving pale segmental lines, the anal tuft with dorsal and subdorsal blackish streaks; antennæ whitish tinged with fuscous, the basal joint black; palpi ochreous white with blackish marks at sides of 1st and 2nd joints; pectus, legs, and ventral surface of abdomen ochreous white, the fore coxæ with black spots, the mid femora and tibiæ with black spots and the tarsi ringed black and white. Fore wing whitish suffused with ochreous; the costal edge black towards base and a black spot at base of cell; a subbasal black spot on inner margin; antemedial line blackish with a black spot at costa, excurved at median nervure and angled inwards at vein 1; a small rather elongate black annulus in middle of cell and rather irregular black discoidal spot conjoined to a spot on costa; a spot below end of cell; the veins beyond the cell streaked with black to the postmedial line, which is blackish with a black spot at costa, angled outwards at vein 6 and inwards at discal fold, then excurved to vein 3 on which it is retracted, then rather oblique and angled outwards at vein 1; the terminal area with a black spot on costa, rather triangular patch between veins 7 and 4, and patch from below vein 3 to tornus; a black terminal line; cilia chequered ochreous white and black. Hind wing whitish suffused with fuscous brown; a blackish terminal line; cilia whitish tinged with brown and with brown line near base.

*Hab.* ECUADOR, Queredo, 1 ♂ type. *Exp.* 16 mm.

(95 a) *Lamprosema niposemalis*, sp. n.

♂. Head, thorax, and abdomen brown with a cupreous gloss, the last with the anal segment and tuft white tinged with red-brown, the anal segment dilated and flattened and the genital tufts large; palpi white in front to near extremity of 2nd joint; pectus, legs, and ventral surface of abdomen ochreous white, the fore and mid legs suffused with ochreous brown, the fore femora blackish above, the tibiæ black on terminal half and the tarsi banded with blackish. Fore wing brown with a cupreous gloss; antemedial line indistinct, brown, sinuous; a small white spot defined by dark brown in upper

part of middle of cell and white discoidal lunule defined by dark brown; postmedial line white defined on inner side by dark brown, excurved at vein 6 and from vein 5 to 2, then retracted and erect to inner margin; cilia white tinged with cupreous brown. Hind wing brown with a cupreous gloss, whitish towards base; a brown discoidal bar and line from below angle of cell to inner margin; postmedial line brown, incurved at discal fold, then oblique and ending on vein 2 near termen; a waved brown terminal line; cilia whitish suffused with cupreous brown.

*Hab.* BR. N. GUINEA, Mailu (*Anthony*), 1 ♂ type. *Exp.* 16 mm.

(97 c) *Lamprosema ædiproctalis*, sp. n.

♂. Head fuscous brown; thorax and abdomen whitish suffused with red-brown, the latter with the anal segment dilated; palpi, pectus, legs, and ventral surface of abdomen white tinged with brown, the fore tibiæ black above and the tarsi banded black and white. Fore wing whitish suffused with brown, the veins slightly streaked with brown and the costal edge black; an indistinct diffused brown subbasal line; antemedial line brown, excurved below median nervure and bent outwards to inner margin; a brown annulus in middle of cell and whitish discoidal lunule defined by dark brown; postmedial line dark brown defined on outer side by whitish, excurved at vein 7, incurved at discal fold, then excurved to vein 2, then obsolescent and retracted upwards to beyond lower angle of cell and excurved at vein 1; the terminal area with a brown shade to vein 3 and spot above tornus; a dark brown terminal line to vein 2; cilia white at base, then pale brown, chequered with white towards tornus. Hind wing white tinged with brown; a sinuous dark brown line from upper angle of cell to inner margin; postmedial line rather diffused brown, incurved at discal fold, excurved at vein 5, and ending at tornus; a brown terminal shade, broad at costa and ending at vein 2; cilia white, chequered with brown except at base.

*Hab.* SOLOMON Is., Rendova I. (*Meek*), 1 ♂ type. *Exp.* 18 mm.

(97 e) *Lamprosema platyproctalis*, sp. n.

♂. Head, thorax, and abdomen reddish brown mixed with white, the last with white segmental bands, the anal segment whitish, dilated and flattened, the genital tufts ochreous white; antennæ ringed with blackish; pectus, legs, and ventral surface of abdomen white, the legs banded with brown. Fore wing white irrorated with red-brown, the costal area suffused with red-brown; a red-brown subbasal shade; a blackish antemedial bar from costa; a red-brown medial shade; a white discoidal lunule defined by rather diffused red-brown; a diffused red-brown patch beyond lower angle of cell; the terminal part of costa with blackish spots with white

between them; postmedial line red-brown, excurved from discal fold to vein 2, then retracted to below angle of cell and excurved to inner margin, some diffused red-brown before it below costa; the terminal area with red-brown shade to vein 3, small spot above vein 2, and diffused spot at tornus; a waved dark terminal line to vein 2; cilia chequered red-brown and white. Hind wing white tinged with red-brown; a red-brown terminal line; cilia white chequered with red-brown to vein 2.

*Hab.* Ké Is. (Kühn), 1 ♂ type. *Exp.* 16 mm.

(97 g) *Lamprosema flaviterminalis*, sp. n.

♂. Head whitish tinged with red-brown, some orange-red on vertex; thorax and abdomen bright red-brown, the latter with the anal segment whitish tinged with red-brown; palpi dark brown, white in front and the 3rd joint white; pectus, legs, and ventral surface of abdomen white, the legs tinged with red-brown. Fore wing glossy bright red-brown, the termen narrowly and cilia yellowish tinged with rufous. Hind wing glossy bright red-brown, a terminal band and the cilia yellowish tinged with rufous.

*Hab.* PERU, R. Pacaya, 1 ♂ type. *Exp.* 20 mm.

(16 a) *Sylepta disciselenalis*, sp. n.

♂. Head, thorax, and abdomen glossy grey-brown; palpi white in front to near extremity of 2nd joint; pectus, legs, and ventral surface of abdomen white, the legs tinged with brown. Fore wing glossy grey-brown; a small pure white discoidal lunule; a white postmedial bar from vein 8 to discal fold formed by three conjoined spots, then an indistinct dark line slightly defined on outer side by whitish, excurved to below vein 3, then retracted to lower angle of cell, and excurved above inner margin; cilia with a fine whitish line at base. Hind wing glossy grey-brown; a small white postmedial spot at discal fold, then an indistinct dark postmedial line faintly defined on outer side by whitish, slightly bent outwards between veins 5 and 2, then bent inwards to below end of cell and somewhat excurved to inner margin; cilia with a fine white line at base and whitish tips.

*Hab.* BR. C. AFRICA, Mt. Mlanje (Neave), 3 ♂ type. *Exp.* 28 mm.

(50 c) *Sylepta molybdopasta*, sp. n.

♂. Grey-brown with a leaden gloss, the vertex of head with a rufous tinge; palpi rather darker brown, whitish at tips; pectus, legs, and ventral surface of abdomen with a whitish tinge. Fore wing glossy grey-brown; a dark discoidal bar; postmedial line indistinct, brown faintly defined on outer side by whitish, excurved and very slightly waved from vein 6 to 2, then retracted to below angle of cell and erect to inner margin; cilia with a fine white line

at base. Hind wing glossy grey-brown, the cilia with a fine white line at base.

*Hab.* BISMARCK ARCH., Rook I. (*Meek*), 1 ♂ type. *Exp.* 38 mm.

(50 d) *Sylepta subcyaneocalba*, sp. n.

♂. Head, thorax, and abdomen dark glossy brown; palpi white at base; pectus, legs, and ventral surface of abdomen white, the legs tinged with brown, the fore tibiæ brown except at extremity. Fore wing very dark brown glossed with purple; a faint rather diffused dark antemedial line; an indistinct dark discoidal bar; postmedial line faint, dark and rather diffused, erect to vein 3, then retracted to below end of cell and erect to inner margin; a slight pale line at base of cilia. Hind wing very dark brown glossed with purple; traces of a dark discoidal spot and diffused postmedial line; a slight pale line at base of cilia. Underside of fore wing with the basal area white tinged with blue except at costa; hind wing white tinged with blue, the terminal area brown to vein 3, the cilia brown.

♀. Much paler and greyer brown, the wings with the markings more distinct.

*Hab.* CAMEROONS, Ja R., Bitje (*Bates*), 5 ♂, 5 ♀ type. *Exp.* 38 mm.

(50 h) *Sylepta crenilinealis*, sp. n.

♀. Head, thorax, and abdomen pale rufous, the last with slight brown segmental lines except at base; pectus and legs white, the legs tinged with rufous, the fore femora blackish above, the tibiæ with black band at extremity, the tarsi ringed with black; ventral surface of abdomen white banded with rufous. Fore wing pale rufous; antemedial line black, obsolescent at costa, oblique and sinuous to submedian fold, incurved at vein 1 and oblique to inner margin; a small black spot in upper part of middle of cell and elliptical discoidal spot; postmedial line black, crenulate to below vein 3, then retracted to below angle of cell and excurved below submedian fold; the terminal area darker reddish brown; cilia with a whitish line at base, the tips dark brown. Hind wing white tinged with rufous, the terminal area pale reddish brown, narrowing to a point at submedian fold; a small dark spot at lower angle of cell; postmedial line dark, waved to vein 5, then bent outwards and crenulate to above vein 2, on which it is retracted, then excurved to above tornus; a black-brown terminal line; cilia white at base, chequered black-brown and whitish at tips.

*Hab.* DUTCH N. GUINEA, Snow Mts., Oetakwa R. (*Meek*), 1 ♀ type. *Exp.* 40 mm.

(51 a) *Sylepta grisealis*, sp. n.

♂. Head, thorax, and abdomen grey tinged with brown, a dorsal black patch on anal segment, the anal tuft white with subdorsal

black streaks; palpi white towards base; pectus, legs, and ventral surface of abdomen white, the femora and tibiæ tinged with brown, the fore tibiæ with blackish band at extremity. Fore wing grey tinged with brown; a slightly curved blackish antemedial line; a narrow black discoidal lunule; postmedial line blackish, slightly bent outwards and waved from vein 5 from above 2, then retracted to below angle of cell and slightly sinuous to inner margin; cilia whitish tinged with brown and with a blackish line at base. Hind wing grey tinged with brown; an oblique black discoidal bar; postmedial line blackish, bent inwards and almost obsolete on vein 2, then oblique to tornus; cilia whitish tinged with brown and with a blackish line at base. Underside white, the fore wing tinged with brown except on inner area.

*Hab.* PERU, La Mercede, Chanchamayo (*Watkins*), 1 ♂ type.  
*Exp.* 32 mm.

[To be continued.]

## PROCEEDINGS OF LEARNED SOCIETIES.

### GEOLOGICAL SOCIETY.

December 5th, 1917.—Dr. Alfred Harker, F.R.S., President,  
in the Chair.

A Demonstration on the Application of X-Rays to the Determination of the Interior Structure of Microscopic Fossils, particularly with reference to the Dimorphism of the Nummulites, was given by E. Heron-Allen, F.L.S., F.G.S., Pres.R.M.S., and J. E. Barnard, F.R.M.S.

Mr. HERON-ALLEN said that in the year 1826 Alcide d'Orbigny published among the innumerable, and for many years unidentified, nomina nuda that compose his 'Tableau Méthodique de la Classe Céphalopodes' the name *Rotalia dubia*. This species was left untouched by Parker & Jones in their remarkable series of articles 'On the Nomenclature of the Foraminifera.' The French naturalist G. Berthelin was the first investigator to unearth and make use of the 'Planches inédites' which had been partly completed by d'Orbigny for the illustration of his great work upon the Foraminifera, a work that was never published. Working with Parker & Jones's paper, Berthelin made for his own use careful tracings of 246 of A. d'Orbigny's unfinished outline-sketches. These sketches were never elaborated by d'Orbigny upon the 'Planches,' which are still preserved in the Laboratoire de Paléontologie under the care of Prof. Marcellin Boule; among them was found the sketch of *Rotalia dubia*. On the death of Berthelin the tracings passed into the possession of Prof. Carlo Fornasini of Bologna, who reproduced them all in a valuable series of papers published between the years 1898 and 1908. Fornasini's opinion



was that the organism depicted by d'Orbigny was doubtfully of Rhizopodal nature, and that it was probably referable to the Ostracoda. The speaker said that he had examined the d'Orbigny type-specimens in Paris in 1914, and had noted that *Rotalia dubia* was a worn and unidentified organism, resembling an Ostracod.

There the matter rested until Mr. Arthur Earland and the speaker, while examining the material brought by Dr. J. J. Simpson from the Kerimba Archipelago (Portuguese East Africa) in 1915, discovered one or two undoubted Foraminifera of an unknown type, which resembled Berthelin's tracing. Prof. Boule kindly sent the d'Orbigny type-specimen to London, and the Rhizopodal nature of *Rotalia dubia* was established. It is not a *Rotalia*, and it must await determination until more specimens are obtained. It has been named provisionally *Pegidia papillata*. There were two or three forms of the organism, but only one perfect specimen of the d'Orbigny type; and it was undesirable to risk destruction by cutting a section of it. In these circumstances Mr. Barnard was approached, and he experimented with the object of ascertaining the interior structure of the shell by means of the X-rays. His results were extraordinarily promising, and led to further experiments.

The speaker showed on the screen photographs of the common and dense Foraminifer *Massilina secans* (d'Orb.), followed by a skiagraph of the same. A skiagraph of the still denser test of *Biloculina bulloides* d'Orb. shows the arrangement of the earlier chambers as clearly as it is indicated in Schlumberger's beautiful sections. The application of X-rays to the dense imperforate shells *Cornuspira foliacea* (Philippi) produced skiagraphs showing the dimorphism of the shells, both megal- and microspheric primordial chambers being clearly distinguishable. Such results led to the extension of the experiments to the agglutinated arenaceous forms, of which sections are made with extreme difficulty. The skiagraph of *Astrorhiza arenaria* Norman shows the internal cavities that contained the protoplasmic body. Two arenaceous forms, *Botellina labyrinthica* Brady and *Jaculella obtusa* Brady, that are almost identical in external appearance, are distinguished at once by their respective skiagraphs, the one exhibiting a simple tubular cavity, the other appearing labyrinthic.

Mr. Barnard subsequently experimented on still more difficult material. The massive *Operculina complanata* Defrance, the umbilical portion of which is obscured by a mass of secondary shell-substance, furnished a clear skiagraph that showed some curious distortions of the internal septa. Similar results were obtained in the case of *Orbiculina adunca* (Fichtel & Moll), another species overlaid with shell-matter. *Cyclammina cancellata* Brady is an arenaceous form, composed of softer mud and sand, studded with coarse sand-grains which make section-cutting almost an impossibility. The skiagraphs, however, reveal the primordial chamber, and establish the character of this form.

The determination of the Nummulites, depending as it does on a knowledge of the internal structure of the test, is greatly

facilitated by the application of X-rays, which removes the necessity of splitting it or cutting sections through it.

The speaker showed ordinary photographs and skiagraphs, made at slightly varying azimuths, of *Nummulites lævigata* and *N. variolaria*, forms that strew the shores of Selsey Bill. A particularly notable result was obtained in the case of *N. gizehensis*, an organism that forms the dense masses of Nummulitic Limestone of which the Pyramids of Egypt and the Citadel at Cairo are built.

Mr. BARNARD said that, although the utilization of X-rays to determine the internal structure of various bodies was well known, he was not aware that the method had been successfully applied to small objects, such as Foraminifera. After he had begun his experiments he found that M. Pierre Goby had done some work in this direction in France, but the method as he described it is surrounded with considerable mystery and elaboration of apparatus, which appear quite unnecessary. The speaker's results were arrived at independently; in fact, they are really a side issue.

His original experiments were directed rather towards the use of X-rays in obtaining magnified images, altogether apart from the usual skiagraphic methods in which a shadowgraph is, in fact, all that can be produced. The primary object has not yet been achieved, although there is some reason to hope that it may ultimately come to pass. The results shown by Mr. Heron-Allen are obtained by quite simple means. A very narrow beam of X-rays, such as would be termed 'a parallel beam' when speaking in terms of ordinary light, is allowed to impinge on the object, the latter being in contact with the photographic plate. The negative produced is, therefore, of the same size as the object. Photographic enlargement is then resorted to, and the result had been shown on the screen. There are two points that require careful attention to if success is to be achieved.

The quality of the X-rays must be suited to the object. In nearly all cases of small objects, what are known as 'soft' X-rays must be used, and the degree of softness is the *crux* of the whole matter. The photographic plate must be of exceedingly fine grain, otherwise the amount of enlargement that can be obtained is very limited. Difficulties in this direction have been overcome, and Mr. Heron-Allen has stated that the results are of considerable biological value.

Dr. A. SMITH WOODWARD, F.R.S., V.P.G.S., exhibited a radiogram of the original slab of lithographic stone containing the skeleton of *Archæopteryx*, made for the British Museum by Dr. Robert Knox in 1916. It was evident that the penetrability of the fossil bones to the X-rays was the same as that of the surrounding matrix. The only portions of the skeleton visible in the radiogram were those more or less raised above the general surface of the slab. This result accorded with that obtained by Prof. W. Bence when he similarly experimented with the Berlin specimen of *Archæopteryx*.

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## CONTENTS OF NUMBER 3.—*Ninth Series.*

	Page
XXII. Brief Descriptions of new Thysanoptera. — IX. By RICHARD S. BAGNALL, F.L.S. ....	201
XXIII. Notes on the <i>Braconidae</i> in the British Museum.—III. On new Australian <i>Agathinæ</i> . By ROWLAND E. TURNER, F.Z.S., F.E.S. ....	221
XXIV. Four new Species of Hedgehog. By OLDFIELD THOMAS ..	230
XXV. A new River-crab from the Transvaal. By W. T. CALMAN, D.Sc. ....	234
XXVI. On the Papuan, Melanesian, and North-Australian Species of the Genus <i>Rana</i> . By G. A. BOULENGER, F.R.S. ....	236
XXVII. Some Notes on the small Sand-Foxes of North Africa. By OLDFIELD THOMAS .....	242
XXVIII. <i>Platynycterus</i> , a new Genus of Asiatic <i>Curculionidae</i> (Coleopt.). By GUY A. K. MARSHALL, D.Sc. ....	245
XXIX. Descriptions of New <i>Pyralideæ</i> of the Subfamily <i>Pyraustince</i> . By Sir GEORGE F. HAMPSON, Bart., F.Z.S., &c. ....	252
PROCEEDINGS OF LEARNED SOCIETIES.	
Geological Society .....	262

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XXX.—*Descriptions of New Pyralidæ of the Subfamily Pyraustinae.* By Sir GEORGE F. HAMPSON, Bart., F.Z.S., &c.

[Continued from p. 262.]

(51 b) *Sylepta brunneiterminalis*, sp. n.

♂. Head and thorax red-brown mixed with some whitish; abdomen yellowish tinged with rufous, a blackish band on 4th segment, the four terminal segments blackish, the genital tufts white; antennæ brown; palpi black-brown, white in front to near extremity of 2nd joint; pectus, legs, and ventral surface of abdomen white tinged with brown, the fore femora and tibiæ and mid tibiæ above fuscous brown. Fore wing ochreous yellow, the base, costal and medial areas suffused with red-brown, the terminal area broadly dark reddish brown glossed with grey; a curved dark brown antemedial line; dark brown spots at middle and end of cell; postmedial line dark brown, rather oblique to discal fold, bent outwards between veins 5 and 3, then curved upwards to median nervure before end of cell and oblique to inner margin; the inner edge of the dark terminal area rather bent outwards between veins 5 and 3; cilia glossed with leaden grey and with a fine whitish line at base. Hind wing ochreous yellow, the basal area suffused with brown, the terminal area broadly dark reddish brown glossed with grey; a dark discoidal bar; postmedial line dark brown, strong, bent outwards between veins 5 and 2, then retracted to lower angle of cell and oblique to inner margin; the inner edge of the dark terminal area bent outwards between veins 5 and 2,

then incurved to tornus; cilia tinged with leaden grey and with white line at base.

♀. Abdomen ochreous yellow tinged with rufous throughout; fore wing with the basal and medial areas less strongly suffused with red-brown; hind wing without the brown suffusion at base, the postmedial line rather angled outwards at vein 2.

*Hab.* S. NIGERIA, Ilesha (*Humfrey*), 1 ♀; BR. E. AFRICA, N. Kavirondo, Maramas Distr., Itala (*Neave*), 1 ♂ type. *Exp.* 24 mm.

(51 g) *Sylepta proctizonalis*, sp. n.

♂. Head ochreous white, the antennæ tinged with brown except towards base, the frons and palpi ochreous tinged with rufous, the latter white in front to near extremity of 2nd joint; thorax ochreous tinged with rufous; abdomen ochreous white, the terminal segments ochreous tinged with rufous, with a black bar before the anal tuft and point at extremity of the tuft; pectus, legs, and ventral surface of abdomen white tinged with ochreous. Fore wing ochreous yellow, the costal area tinged with rufous towards base; a curved blackish antemedial line; a blackish point in upper part of middle of cell and black discoidal bar; postmedial line black, forming a slight spot at costa, bent outwards from vein 5 to above 2, then retracted to below angle of cell and excurved below submedian fold; cilia blackish at base, white at tips. Hind wing ochreous yellow; an oblique blackish discoidal bar; postmedial line black, bent outwards between veins 5 and 2, then retracted to below angle of cell and oblique to above tornus; cilia blackish at base, white at tips.

*Hab.* C. CHINA, Chungking (*Barry*), 3 ♂ type. *Exp.* 30 mm.

(51 h) *Sylepta ochrotichroa*, sp. n.

♂. Head ochreous white, the antennæ tinged with brown except towards base, the palpi ochreous, white in front to near extremity of 2nd joint; thorax and abdomen ochreous yellow with a faint rufous tinge; pectus, legs, and ventral surface of abdomen white, the fore legs tinged with ochreous and with a brownish band near extremity of tibiae. Fore wing ochreous yellow, the base and costal area to end of cell tinged with rufous; a faint oblique sinuous dark antemedial line, arising at subcostal nervure; a minute dark spot in upper part of middle of cell and discoidal bar; postmedial line indistinct, dark, bent outwards and slightly waved between veins 5 and 2, then retracted to below end of cell and excurved below submedian fold; a terminal series of faint dark spots. Hind wing ochreous yellow; an oblique dark discoidal bar; postmedial line indistinct, dark, incurved and more distinct at discal fold, bent outwards and slightly waved from vein 5 to 2 on which it is retracted, then oblique to above tornus; the apex tinged with brown; a terminal series of faint dark spots.

*Hab.* ASSAM, Khâsis (*Nissary*), 1 ♂ type. *Exp.* 28 mm.



(68a) *Sylepta hemipolialis*, sp. n.

♀. Head and tegulae yellow tinged with red-brown; thorax grey-brown; abdomen with the two basal segments yellow tinged with red-brown, then pale grey-brown; antennae whitish tinged with brown; palpi pale grey-brown; pectus, legs, and ventral surface of abdomen ochreous white, the fore tibiae with dark band near extremity. Fore wing yellow tinged with fulvous to the postmedial line, the costal area paler, the terminal area pale grey-brown; the base tinged with grey-brown; a waved brown antemedial line, arising at subcostal nervure; grey-brown annuli at middle and end of cell; postmedial line dark brown with a white patch on its inner side between veins 5 and 3, slightly incurved at discal fold, then excurved to vein 3, then retracted to below end of cell and oblique and sinuous to inner margin, a triangular yellow mark beyond it from costa; cilia with a fine whitish line at base. Hind wing with the basal half pale yellow, the terminal half pale grey-brown; some diffused red-brown below middle of cell and a small spot in lower angle of cell; postmedial line rather diffused dark brown, slightly sinuous, defining the yellow and grey areas; cilia white at base, pale grey-brown at tips.

*Hab.* COLOMBIA, Bonda (*H. H. Smith*), 1 ♀ type. *Exp.* 36 mm.

(71c) *Sylepta albipunctalis*, sp. n.

♂. Head white, the antennae brown except the basal joint; thorax white with red-brown patches at base and extremity of patagia and on mesothorax; abdomen white with subdorsal red-brown patches on three basal segments, then slightly tinged with red-brown; pectus and legs red-brown and white; ventral surface of abdomen white. Fore wing pale red-brown with a cupreous gloss; a curved white band from base of costa to base of inner margin; a short white antemedial streak on subcostal nervure and spots below the cell and on inner margin; two white discoidal points; postmedial line white, excurved from below costa to vein 6, then oblique, sinuous, and only represented by small spots below vein 4, at submedian fold and on inner margin; a series of slight terminal brown spots, defined by some white suffusion towards apex, then by slight white streaks on the veins and by some white at submedian fold; cilia white with a pale brown line near base. Hind wing silvery white, the disk faintly tinged with brown; faint brown postmedial and subterminal spots below vein 2, a minute postmedial spot on vein 1, and a small spot on termen just above tornus.

*Hab.* ECUADOR, Zamora, 1 ♂; BOLIVIA, La Paz (*Garlepp*), 1 ♂ type. *Exp.* 28 mm.

(71 d) *Sylepta albicupralis*, sp. n.

Head white with some pale red-brown on frons and behind the antennæ which are brown, the palpi with the 2nd joint suffused with red-brown; thorax white, the tegulæ with red-brown patches at base, the patagia with their outer halves red-brown, the dorsum with some red-brown suffusion; abdomen white with red-brown dorsal and subdorsal patches except at base and towards extremity; pectus, legs, and ventral surface of abdomen white, the fore femora and all the tibiæ striped with red-brown above. Fore wing red-brown with a cupreous gloss; a small white mark at base; sub-basal white spots on costa and in the cell and an elongate white patch on basal part of inner margin; an indistinct brown ante-medial line, arising below the costa and defined on inner side by white spots below the cell and at inner margin; the medial part of costal area white; white spots in and beyond end of cell; post-medial line brown slightly defined on outer side by white, dentate, incurved below vein 4; a terminal series of minute triangular white spots. Hind wing white, the veins slightly striated with brown; some reddish brown suffusion beyond lower angle of cell and on inner margin before the almost straight reddish brown postmedial line; the terminal area pale reddish brown with a cupreous gloss, broadly at costa, narrowing to inner margin; a terminal series of white bars; cilia reddish brown, whitish at tips.

*Hab.* PERU, R. Pacaya, 2 ♂, 2 ♀ type, Yahuarmayo (*Watkins*), 1 ♀ type. *Exp.*, ♂ 22-26, ♀ 30 mm.

(73 a) *Sylepta fulviceps*, sp. n.

♂. Head, tegulæ, and basal half of patagia fulvous, the rest of thorax and abdomen grey-brown; antennæ brown except towards base; pectus, legs, and ventral surface of abdomen white, the fore femora above, tibiæ, and tarsi pale grey-brown, the mid femora striped with grey-brown, the mid and hind tibiæ and basal joints of tarsi grey-brown. Fore wing pale grey-brown with a slight purplish gloss, the cilia grey-white. Hind wing pale grey-brown with a slight purplish gloss, the cell semihyaline opalescent white, the termen narrowly and cilia grey-white; the underside with the costal area white to beyond middle, the cell and disk glossed with silvery blue.

*Hab.* COLOMBIA (interior) (*Carder*), 1 ♂ type. *Exp.* 30 mm.

(75 a) *Sylepta ochritinctalis*, sp. n.

♂. Head and thorax white mixed with some brownish ochreous; abdomen white tinged with brownish ochreous, the medial segment more suffused with ochreous, leaving whitish dorsal spots; palpi brownish ochreous, white at base and at base of 2nd joint; pectus, legs, and ventral surface of abdomen white tinged with ochreous,

the fore femora above and tibiae at extremities suffused with brown. Fore wing white tinged with brownish ochreous, the area before the postmedial line and the terminal area suffused with brownish ochreous; a narrow brownish ochreous discoidal lunule; postmedial line rather diffused brownish ochreous defined on outer side by white, slightly waved, incurved below vein 4; cilia with a series of brownish bars near base. Hind wing white tinged with brownish ochreous, the area before the postmedial line and the terminal area suffused with brownish ochreous; postmedial line rather diffused brownish ochreous, bent outwards and slightly waved between veins 5 and 2; cilia with a series of brownish bars near base to vein 2.

*Hab.* D'ENTRECASTEAUX Is., Fergusson I. (*Meek*), 1 ♂ type. *Exp.* 30 mm.

(80 a) *Sylepta euryterminalis*, sp. n.

♂. Head, thorax, and abdomen pale yellow, the shoulders with red-brown stripes, the abdomen tinged with red-brown except at base; antennae cupreous brown; palpi yellowish white, the 2nd joint above obliquely, and the 3rd joint dark brown; pectus, legs, and ventral surface of abdomen yellowish white, the fore tibiae with brown spot near extremity. Fore wing yellow, the costal area pale red-brown to the postmedial line, the terminal area broadly red-brown; antemedial line pale rufous, excurved to vein 1 and incurved above inner margin; a small dark reddish brown spot in middle of cell and oblique discoidal bar; postmedial line dark reddish brown, rather diffused, excurved between veins 5 and 2, then retracted upwards to angle of cell and oblique and sinuous to inner margin, a yellow patch beyond it from costa to vein 6. Hind wing yellow; a rather diffused reddish brown line from upper angle of cell to above inner margin, rather dilated at end of cell; postmedial line strong, dark reddish brown, arising below costa, excurved from vein 5 to 2, where it terminates; the terminal area red-brown, its inner edge oblique to vein 2 near termen, then dilated into a patch in submedian interspace touching the postmedial line and not extending below vein 1; cilia red-brown except towards tornus.

*Hab.* FORMOSA, Kanshirei (*Wileman*), 1 ♂ type. *Exp.* 32 mm.

(86 a) *Sylepta rogationis*, sp. n.

Head white, the antennae red-brown with a white spot on basal joint, the frons tinged with red-brown, the palpi red-brown, white in front at base; thorax pale red-brown mixed with some white; abdomen white tinged with pale red-brown; pectus, legs, and ventral surface of abdomen white, the fore coxae, femora, and tibiae suffused with red-brown. Fore wing yellowish white, the costal area to the postmedial line, the inner margin except towards base, and the terminal area red-brown; a diffused incurved red-brown subbasal line; antemedial line red-brown, oblique to median

nervure; a red-brown spot in middle of cell and discoidal bar; the median nervure towards extremity and a patch beyond lower angle of cell red-brown; postmedial line red-brown, excurved between veins 5 and 2, then retracted to lower angle of cell and excurved to inner margin; the inner edge of the red-brown terminal area waved, excurved between veins 5 and 2, then expanding into a patch confluent with the postmedial line; cilia white towards tornus. Hind wing yellowish white; an oblique brown discoidal bar; the veins beyond lower angle of cell streaked with brown; postmedial line rather diffused red-brown, excurved between veins 5 and 2, then retracted to below angle of cell and ending above inner margin; the terminal area red-brown, its inner edge waved and excurved between veins 5 and 2; cilia red-brown with a fine white line at base to vein 2, then white with a red-brown line near base.

*Hab.* BR. C. AFRICA, Mt. Mlange (*Neave*), 1 ♂, 1 ♀; PORTUGUESE E. AFRICA, Mt. Chipirone (*Neave*), 2 ♂, 1 ♀ type. *Exp.* 32 mm.

(86 *f*) *Sylepta sulphureotincta*, sp. n.

Head, thorax, and abdomen yellowish white tinged with rufous; palpi rufous, white in front towards base; pectus, legs, and ventral surface of abdomen white, the fore tibiae with rufous band at extremity. Fore wing white tinged with sulphur-yellow, the base and costal area pale rufous; antemedial line dark tinged with yellow, oblique to just below the cell, then erect; a dark annulus in middle of cell and discoidal bar tinged with yellow and filled in with white; postmedial line dark tinged with yellow, excurved and waved between veins 5 and 2, then retracted to below angle of cell and angled outwards below submedian fold, a similar faint line beyond it; a red-brown terminal line; cilia with a faint red-brown line near base. Hind wing white, the terminal area tinged with sulphur-yellow except at tornus; a dark discoidal bar; postmedial line dark, bent outwards and waved between veins 5 and 2, then retracted to below angle of cell and erect to inner margin; a faint waved brownish subterminal line; a red-brown terminal line and rufous line near base of cilia except towards tornus.

*Hab.* BR. C. AFRICA, Ruu Valley (*Neave*), 1 ♀; PORTUGUESE E. AFRICA, Mt. Chipirone (*Neave*), 2 ♂ type. *Exp.* 24 mm.

(111 *a*) *Sylepta microstictalis*, sp. n.

♂. Head, thorax, and abdomen dark brown glossed with leaden grey; frons with white lines at sides; palpi white in front towards base; coxae, mid tibiae, fore and mid tarsi, and ventral surface of abdomen white tinged with brown. Fore wing dark brown with a cupreous gloss; a faint curved dark antemedial line with a slight whitish spot before it in the cell; a small quadrate white spot in end of cell defined on each side by black-brown; a slight whitish postmedial bar from below costa to discal fold, then a very faint

dark line, retracted at vein 2 to below angle of cell, then excurved; cilia glossed with leaden grey except at base. Hind wing dark brown with a cupreous gloss; a fine pale line at base of cilia followed by a dark line.

Ab. 1. Fore wing with some ochreous white before the antemedial line in and below the cell, the spot in end of cell larger and extending to median nervure, the postmedial bar ochreous white, broader and with slightly sinuous outer edge.

*Hab.* CAMEROONS, Ja R., Bitje (*Bates*), 2 ♂ type. *Exp.* 28 mm.

(115 a) *Sylepta maculilinealis*, sp. n.

♂. Head, thorax, and abdomen brown suffused with grey, pectus and ventral surface of abdomen white; tarsi white slightly tinged with brown. Fore wing brown suffused with grey; antemedial line brown defined on each side by white, arising at subcostal nervure; a white spot in end of cell before the blackish discoidal bar; postmedial line dark defined on outer side by a narrow white band to vein 5, then by small white spots, incurved to vein 5, where it is slightly angled outwards, then very slightly waved, oblique to vein 3, then strongly incurved; cilia with a white line at base. Hind wing brown suffused with grey; a small blackish discoidal spot with whitish spot before it; an irregularly sinuous dark postmedial line defined on outer side by a narrow rather maculate white band from costa beyond middle to inner margin before middle, touching the lower angle of cell; cilia with a white line at base to submedian fold, then white with a brown line near base.

*Hab.* UGANDA, Chagwe, Mabira Forest (*Neave*), 1 ♂ type. *Exp.* 32 mm.

(10 a) *Lygropia leucostolalis*, sp. n.

Head and thorax white suffused with fulvous yellow; abdomen white, dorsally slightly tinged with rufous except towards base; antennæ tinged with brown; palpi orange-yellow; pectus, femora, tibiæ, and ventral surface of abdomen tinged with rufous, the tarsi white. Fore wing pure white, the base tinged with orange-yellow; a small rather elongate black spot in middle of cell, and rather lunulate discoidal spot. Hind wing pure white. Underside of fore wing with the costa brownish grey.

*Hab.* SIERRA LEONE, Resorse (*Simpson*), 1 ♂, Port Lokko (*Simpson*), 1 ♂; GOLD COAST, Kumasi (*Sanders*), 1 ♂; CAMEROONS, Ja R., Bitje (*Bates*), 2 ♂, 2 ♀ type; UGANDA, Unyoro, Bugoma Forest (*Neave*), 1 ♀. *Exp.*, ♂ 28-36, ♀ 36-42 mm.

(36 b) *Lygropia fulvescens*, sp. n.

♀. Head, thorax, and abdomen fulvous yellow tinged with rufous; pectus, femora, and ventral surface of abdomen white tinged with fulvous, the tibiæ and tarsi white. Fore wing fulvous yellow suffused with rufous; an indistinct oblique sinuous dark antemedial line; a small faint dark discoidal lunule; postmedial

line dark defined on outer side by yellowish, waved, excurved from below costa to vein 4, then incurved; a terminal series of dark points; cilia with a slight dark line at middle. Hind wing white with a slight fulvous yellow tinge, the terminal area more suffused with fulvous to vein 2; a terminal series of blackish points; cilia fulvous yellow at base to vein 2.

*Hab.* COLOMBIA, Las Parlutas (*H. H. Smith*), 1 ♀ type. *Exp.* 20 mm.

(36 c) *Lygropia gilvicostalis*, sp. n.

♂. Head and thorax brown glossed with leaden grey, the back of head whitish; abdomen pale grey-brown with yellowish segmental lines; antennæ dark brown; frons with white lines at sides; palpi with the basal joint and the 2nd joint in front white; pectus, legs, and ventral surface of abdomen white, the femora and tibiæ tinged with brown above. Fore wing brown glossed with leaden grey, the costal area pale yellow to the postmedial line; antemedial line indistinct, dark faintly defined on inner side by yellowish white, angled outwards at submedian fold, then incurved; a faint dark discoidal spot; postmedial line rather diffused, dark, defined on outer side by a triangular pale yellow spot at costa, then faintly by whitish to vein 2, then by yellowish white, excurved to vein 4, then incurved; a diffused white terminal line from vein 3 to tornus. Hind wing white, the inner margin tinged with reddish brown; a rather diffused rufous terminal line; cilia tinged with rufous and with faint brown line at middle.

*Hab.* PERU, R. Ucayale, Contamino, 1 ♂ type. *Exp.* 24 mm.

Genus GLYPHODES.

	Type.
<i>Idalia</i> , Hübn. Verz. p. 308 (1827), nec p. 129.....	<i>sinuata</i> .
<i>Margaronia</i> , Hübn. Verz. p. 358 (1827), has priority .....	<i>unionalis</i> .

(32 a) *Margaronia albianalis*, sp. n.

Head, thorax, and abdomen red-brown with a cupreous gloss, the last with the anal segment white with a black dorsal spot at extremity, the anal tuft formed by pale rufous scales dark at extremities; pectus, femora, and ventral surface of abdomen silvery white; tibiæ and tarsi brown with a white line at extremity of former; anal tuft black-brown below. Fore wing red-brown with a cupreous gloss; a fine white line at base of cilia. Hind wing whitish tinged with red-brown, the veins and terminal area glossy red-brown; cilia with a white line at base. Underside whitish suffused with red-brown, the terminal areas red-brown.

*Hab.* COLOMBIA, Choko, R. Siato, 1 ♀; ECUADOR, R. Pastaza, R. Verde (*Palmer*), 2 ♂ type; PERU, Chanchamayo, La Mercede (*Watkins*), 1 ♂. *Exp.* 28-32 mm.

(33 a) *Margaronia semirufalis*, sp. n.

♂. Head, thorax, and abdomen rufous, the last with silvery white segmental lines on three terminal segments, the anal tuft with some black-brown at base; antennæ with dark rings; palpi dark brown, yellowish rufous at base and extremity; pectus, legs, and ventral surface of abdomen white tinged with rufous, the fore femora dark above, the fore tibiæ with dark band at extremity, the tarsi whiter. Fore wing rufous to the postmedial line, the terminal area red-brown with a cupreous gloss, the costal area rufous beyond the postmedial line; antemedial line red-brown, slightly waved; a rufous discoidal bar defined at sides by red-brown; a diffused oblique dark brown postmedial line, slightly excurved beyond lower angle of cell; cilia with some whitish at tips. Hind wing rufous, the terminal area red-brown with a cupreous gloss, narrowing to tornus; a faint brown postmedial line, slightly excurved beyond lower angle of cell; cilia with fine whitish line at base and some whitish at tips.

*Hab.* PERU, El Porvenir, 2 ♂ type. *Exp.* 38 mm.

(33 b) *Margaronia monothyalis*, sp. n.

♂. Head, thorax, and abdomen brown glossed with silvery grey, the last with the anal segment white with dorsal black spot at extremity, the anal tuft formed by rufous scales white at base and dark at extremity; palpi white at base; pectus and ventral surface of abdomen silvery white, the legs white tinged with brown. Fore wing glossy reddish brown tinged with grey, the costal edge white except towards base; a blackish discoidal striga with a reniform semihyaline yellowish white spot beyond it; cilia with a fine white line at base. Hind wing pale glossy reddish brown tinged with grey; cilia with a white line at base and whitish tips.

*Hab.* COLOMBIA, Sierra del Libane (*H. H. Smith*), 1 ♂ type. *Exp.* 34 mm.

(37 a) *Margaronia punctilinealis*, sp. n.

♂. Head, thorax, and abdomen glossy reddish brown tinged with grey, the anal tuft white tinged with rufous and with dark tips to the scales; sides of frons and palpi dark brown, the latter white at base; pectus, femora, and ventral surface of abdomen silvery white, the tibiæ and tarsi brown. Fore wing reddish brown with a cupreous gloss; a curved punctiform white postmedial line from vein 7 to 2, then a faint oblique whitish line; cilia with a fine white line at base. Hind wing reddish brown with a cupreous gloss; a slightly curved rather punctiform white postmedial line from vein 6 to inner margin; cilia with a fine white line at base.

*Hab.* COLOMBIA, Choko, Juntas de R. Tamana and R. San Juan (*Palmer*), 1 ♂ type. *Exp.* 28 mm.

(66 d) *Margaronia viriditinctalis*, sp. n.

♂. Head and thorax silvery white, the tegulae at base and shoulders rufous; abdomen creamy white, the anal tuft black at sides; sides of frons and palpi rufous, the latter white at base; pectus, legs, and ventral surface of abdomen silvery white. Fore wing silvery white tinged with greenish yellow; a rufous costal fascia with a pure silvery white streak below it; a black point at upper angle of cell; a fine red-brown terminal line with black points in the interspaces; cilia white. Hind wing semihyaline silvery white tinged with greenish yellow; a fine red-brown terminal line with black points in the interspaces; cilia white.

*Hab.* PERU, Chaquimayo (*Watkins*), 2 ♂ type. *Exp.* 30 mm.

(69 c) *Margaronia lobisignalis*, sp. n.

Head, thorax, and abdomen silvery white, the thorax with some rufous mixed, the abdomen with black dorsal bar on 3rd segment, the two terminal segments and the anal tuft black with a silvery gloss; palpi black with a silvery gloss; pectus, legs, and ventral surface of abdomen white, the fore femora above, the tibiae and extremity of abdomen black-brown. Fore wing silvery white; the costal area suffused with red-brown, expanding into antemedial and medial lobes defined by black to median nervure, into a discoidal bar bent inwards and lobed at lower extremity also defined by black, and into a semicircular subterminal spot defined by black except above; subterminal black-brown striae in the interspaces to vein 5 and a striga below vein 2; a black-brown terminal line glossed with silver to vein 4. Hind wing silvery white; a pale rufous reniform discoidal spot defined by dark brown, concave towards base; dark brown subterminal striae at discal and submedian folds.

*Hab.* BR. C. AFRICA, Mt. Mlanje (*Neave*), 4 ♂, 2 ♀ type. *Exp.* 18–22 mm.

(71 a) *Margaronia approximalis*, sp. n.

♂. Head, thorax, and abdomen silvery white, the sides of head, neck, and shoulders dark cupreous brown, the abdomen faintly ringed with cupreous brown towards extremity; palpi with a small dark cupreous brown spot at base of 2nd joint, its terminal half and the 3rd joint dark cupreous brown; fore femora and tibiae above dark cupreous brown, the tarsi ringed with cupreous brown. Fore wing silvery white faintly tinged with cupreous brown, the interspaces somewhat semihyaline; the costal edge and a slight streak below it dark cupreous brown towards base; an antemedial cupreous brown striga from costa and an oblique medial line; a discoidal bar defined by cupreous brown and constricted at middle; a cupreous brown annulus below end of cell; a cupreous brown postmedial line, bent inwards below costa and excurred from vein 7



to inner margin; a rather oblique cupreous brown subterminal line arising below the costa and approximated to the postmedial line between veins 3 and 2; a fine dark cupreous brown terminal line except towards tornus. Hind wing somewhat semihyaline silvery white; a slight cupreous brown discoidal striga; a pale cupreous brown postmedial line, arising at vein 7, slightly incurved at vein 2 and ending at tornus; a fine dark cupreous brown terminal line to submedian fold; cilia with a slight brown line near base.

*Hab.* BR. N. GUINEA, Owgarra (*Meek*), 1 ♂ type. *Exp.* 28 mm.

(85 a) *Margaronia titanicalis*, sp. n.

♂. Head, thorax, and abdomen silvery white tinged with very pale green; the sides of head, base of tegulæ, and shoulders fulvous; antennæ white tinged with fulvous; palpi fulvous, the basal joint and base of 2nd joint in front white; anal tuft black; mid tibiæ with fulvous streak above towards base; (fore legs wanting). Fore wing silvery white tinged with very pale green; a fulvous costal fascia to end of cell; a terminal series of slight black points. Hind wing white tinged with very pale green; a slight dark terminal line to vein 2.

*Hab.* SOLOMON Is., New Georgia (*Meek*), 1 ♂ type. *Exp.* 64 mm.

(90 a) *Margaronia euchlorisalis*, sp. n.

Head, tegulæ, and prothorax rufous, the frons white, the rest of thorax and abdomen bright yellow green with a white band behind the prothorax and band on 2nd segment of abdomen; anal tuft dark red-brown; antennæ white with some red-brown towards base; pectus, legs, and ventral surface of abdomen white, the fore tibiæ red-brown above with a white band near base, the mid and hind tibiæ with a small black spot at extremity. Fore wing bright yellow-green; the costa pale green with a yellow fascia below it defined by white below, extending to inner margin at base, which is tinged with rufous; an oblique white antemedial line, arising from the costal fascia and obsolescent towards inner margin; an oblique white discoidal bar; a narrow oblique white band from the costal fascia before apex to termen at vein 4; a terminal series of slight black points from vein 4 to tornus; cilia white tinged with green. Hind wing bright yellow-green; a diffused oblique white band from costa before apex to termen at vein 4; a terminal series of slight blackish points and some rufous on termen above vein 1; cilia pale green at base and their tips tinged with rufous to submedian fold, then wholly rufous.

*Hab.* PERU, Yahuar Mayo (*Watkins*), 3 ♂, 1 ♀ type. *Exp.* 38-42 mm.

(122 a) *Margaronia polystrigalis*, sp. n.

♂. Head and thorax white tinged with red-brown, the tegulae with minute dark spots, the patagia with elongate dark marks at middle; abdomen whitish suffused with red-brown and with oblique whitish subdorsal bars defined by darker brown on 2nd to 4th segments, the anal tuft black-brown mixed with red-brown; palpi white with some brown in front of 2nd joint; pectus, legs, and ventral surface of abdomen white tinged with red-brown, the fore tibiae with black band at extremity. Fore wing white tinged with red-brown and thickly striated with dark brown, the medial area with more prominent black-brown striae from costa; an indistinct oblique dark subbasal line; a double oblique dark antemedial line, incurved at vein 1 and the inner line bent inwards to costa; a minute dark spot in cell towards extremity and discoidal lunule defined by dark brown and with dark striga in centre; a double dark line from lower angle of cell, filled in with ochreous and dilated on outer side into a spot at inner margin below a rounded white patch defined by dark brown and with dark spot in centre; postmedial line double, dark brown filled in with ochreous, slightly sinuous and ending above vein 1 beyond the rounded patch; two slightly and irregularly waved brown subterminal lines; an ochreous terminal line defined on inner side by a brown line; cilia with a silvery gloss. Hind wing white tinged with red-brown and striated with dark brown; slight dark subbasal marks on median nervure and vein 1; an ochreous discoidal bar defined by dark brown and two slight dark marks below end of cell; a double oblique slightly waved brown line filled in with ochreous from costa beyond middle to above tornus; a waved brown line from costa before apex to termen at vein 1 with another line rather broken up into spots beyond it; a red-brown terminal line to vein 1; cilia with an ochreous line at base followed by a fine red-brown line, the tips white mixed with red-brown.

*Hab.* BR. N. GUINEA, Collingwood Bay, Haidana (*Meek*), 1 ♂, Owgarra (*Meek*), 1 ♂ type. *Exp.* 30 mm.

(3) *Furcivena atribasalis*, sp. n.

Fore wings with veins 4, 5 stalked; hind wing with veins 4, 5 from cell; antennae of male with small scale-teeth at the joints.

♂. Head, tegulae, and base of patagia white, the rest of thorax dark brown with a cupreous gloss, the metathorax edged with white at sides and behind; abdomen white, dorsally suffused with reddish ochreous leaving white segmental lines; antennae ochreous, the tufts of scales at the joints brownish towards base; palpi ochreous, the basal joint and the 2nd joint below white; pectus, legs, and ventral surface of abdomen white, the tarsi orange-yellow ringed with white. Fore wing with the basal area white with a broad black-brown band near base, narrowing to inner margin; the rest of wing yellow tinged with rufous leaving the costal edge and apex white; an oblique brownish postmedial line from vein 4 to inner

margin; a small blackish brown spot on termen just below apex and points at veins 7 and 6; the termen suffused with brown below the white area at vein 6; cilia white tinged with ochreous, brownish at tips to vein 4. Hind wing white with a slight ochreous tinge beyond the cell, the termen tinged with brown except towards apex and tornus; a curved brownish postmedial line from vein 5 to above tornus; a fine brown terminal line; cilia white.

*Hab.* PERU, R. Pacaya, 1 ♂ type. *Exp.* 22 mm.

Genus SAMEODES.

Type.

*Epipages*, Hübn. Verz. p. 357 (1827), has priority ..... *fenestralis*.

(5 b) *Epipagis setinalis*, sp. n.

♀. Head, thorax, and abdomen ochreous yellow; tarsi ringed with black. Fore wing ochreous yellow; a black point at base of cell; a black point in middle of cell and slight obliquely placed blackish spots in submedian fold and above inner margin; a black discoidal striga; a postmedial series of small wedge-shaped black marks on the veins from below costa to vein 2 and a small spot on vein 1, rather oblique to vein 5, then incurved; a curved subterminal series of elongate black marks on veins 7 to 2. Hind wing ochreous yellow; a curved postmedial series of minute rather wedge-shaped blackish marks on veins 6 to 2 and a subterminal series of slight elongate blackish marks on veins 7 to 3.

*Hab.* FORMOSA, Kanshirei (*Wileman*), 1 ♀ type. *Exp.* 34 mm.

(8 p) *Epipagis costistictalis*, sp. n.

Head and thorax grey-brown mixed with ochreous yellow, the metathorax ochreous; abdomen greyish brown mixed with some ochreous yellow and with ochreous yellow segmental bands on basal half; pectus, legs, and ventral surface of abdomen white tinged with ochreous yellow. Fore wing reddish brown, the terminal half of costa yellowish white with five small black spots on it; some yellowish at base; a faint dark antemedial line, arising at subcostal nervure and slightly excurved above inner margin; a small yellowish white spot before it below the cell, an elliptical spot beyond it in and below the cell, defined by blackish and bisected by a brown streak on median nervure, slight yellowish marks before and beyond it above inner margin; a quadrate yellowish white spot defined by blackish in middle of cell, a spot below it in submedian interspace, and a small spot above base of vein 2; postmedial line blackish, arising below the costa, excurved between veins 5 and 2, on which it is retracted to below end of cell and ending at vein 1, defined on inner side by yellowish white spots between veins 7 and 2, the spot above vein 6 minute, on outer side defined by small rather conical spots between veins 7 and 2 and by a larger spot in submedian interspace; cilia yellowish white with a series of small dark spots near base, the tips brown between veins 5 and 3. Hind

wing yellowish white, the terminal area brown suffused with grey; some brown at extreme base; a quadrate dark brown discoidal spot, its centre tinged with grey, with an oblique sinuous brown line from it to above inner margin where it is rather diffused; post-medial line dark brown, strongly excurved between veins 5 and 2, then defining the inner edge of the terminal area, with a yellowish white spot on its outer side from below costa to vein 5 and small spots between veins 5 and 2; cilia yellowish white with a series of small brown spots and bars near base, the tips intersected by brown below apex and at middle.

*Hab.* COLOMBIA, Choko, San Juan, La Selva, 1 ♂; BRAZIL, Amazons, Para (*Trumbill*), 1 ♂; Manãos (*Trumbill*), 1 ♀; PERU, Carabaya, Tinquiri (*Ockenden*), 2 ♀, Oceneque (*Ockenden*), 1 ♀; BOLIVIA, La Paz (*Garlepp*), 1 ♂ type. *Exp.* 22-24 mm.

#### Genus SAMEODESMA, nov.

Type, *S. flavicostalis*.

Proboscis fully developed; palpi porrect, the 2nd joint extending about the length of head and fringed with hair above, the 3rd moderate and smoothly scaled; maxillary palpi filiform; frons rounded; antennæ somewhat laminate and almost simple. Fore wing with the apex rounded, the termen evenly curved; vein 3 from well before angle of cell; 4, 5 from angle; 6 from well below upper angle; 7 from angle and straight; 8, 9 stalked; 10, 11 stalked. Hind wing with vein 3 from angle of cell; 4, 5 shortly stalked; 6, 7 from upper angle, 7 anastomosing with 8 to towards apex.

#### (1) *Sameodesma flavicostalis*, sp. n.

♀. Head and thorax pale yellow; abdomen yellow tinged with rufous; antennæ and palpi tinged with rufous; pectus, legs, and ventral surface of abdomen yellowish white, the tarsi fuscous at extremities. Fore wing violaceous grey tinged with diffused red-brown towards the yellow markings; the base pale yellow except at costa; an obliquely curved reddish brown antemedial line, incurved at median nervure, the costal area beyond it pale yellow, expanding to discal fold in the cell and into a postmedial spot to vein 6; a lunulate greyish discoidal spot defined by red-brown and with a slight yellow spot before it in lower end of cell; the terminal area pale yellow, broadly at costa and narrowing to a point at vein 2, its inner edge defined by a red-brown line, oblique to vein 5 and with slight diffused rufous spot beyond it at discal fold on the yellow area; a terminal series of minute rufous points on the yellow area; cilia yellow with some brown at base at tornus. Hind wing creamy white, the area beyond the cell faintly tinged with red-brown from below costa to submedian fold.

*Hab.* GOLD COAST, Kumasi (*Sanders*), 2 ♀ type. *Exp.* 20 mm.

(2) *Sameodesma undilinealis*, sp. n.

♂. Head and thorax brownish grey mixed with black; abdomen grey suffused with brown; antennæ black; palpi, pectus, legs, and ventral surface of abdomen grey suffused with brown. Fore wing grey suffused with brown and thickly irrorated with black; a waved blackish subbasal shade; the first line almost medial, brownish white defined on outer side by rather diffused black, excurved to median nervure and incurved in submedian interspace; an oblique brownish white discoidal lunule defined by black and with some black suffusion before it in upper part of cell; postmedial line brownish white defined on inner side by diffused black marks and on outer side by diffused black towards costa, incurved at vein 7, then excurved to vein 2, incurved in submedian interspace and excurved at vein 1; a series of slight black bars on termen defined on inner side by a whitish line with diffused black marks before it; cilia grey tinged with brown and with slight dark lines at middle and near tips. Hind wing grey suffused with olive-brown; a slight dark terminal line; cilia with a slight dark line near base, the tips paler.

*Hab.* MASHONALAND, Salisbury (*Jack*), 1 ♂ type. *Exp.* 24 mm.

(3 a) *Thliptoceras androstigmata*, sp. n.

♂. Head and tegulæ rufous; thorax red-brown; abdomen red-brown, the two terminal segments and the sides on terminal half yellow tinged with red; antennæ ringed with white, the basal joint whitish; sides of frons and palpi chocolate-brown, the latter white below to near extremity of 2nd joint; pectus, legs, and ventral surface of abdomen white, the fore legs suffused with brown with white rings at extremity of tibiæ and on tarsi. Fore wing red-brown suffused with leaden grey; some yellowish suffused with red at base of inner margin; a yellow streak tinged with red on antemedial part of costa; rounded white spots defined by crimson-red, except above where they are conjoined to the yellow fascia, in the cell before middle and near extremity; an oblique white spot defined by crimson-red below end of cell; an orange-yellow postmedial spot at costa defined on outer side by a blackish striga and conjoined below to a rather quadrate white spot placed on a crimson-red patch the outer edge of which is curved and extends from the costa beyond the blackish striga to vein 2; the costa towards apex yellow tinged with red; the termen orange-yellow, narrowly from just below apex to vein 5, then expanding into a triangular patch ending in a point at tornus; cilia orange-yellow with some brown at apex. Hind wing with the basal area crimson-red except at costa, its outer edge slightly excurved beyond the cell and strongly below vein 2, an oblique white spot on it below end of cell, pointed above, constricted at middle, and rounded below; the costa white; a broad white postmedial band from the costal area to vein 2, defined on outer side by a crimson-red line and by orange-yellow below; a leaden grey band on its outer side from below the costa to inner

margin; the terminal area orange-yellow, rather broadly at costa and narrowing to tornus; a fine reddish terminal line.

♀. Head and thorax red-brown suffused with leaden grey; hind wing red-brown suffused with leaden grey except the orange-yellow terminal area and without the white markings.

*Hab.* DUTCH N. GUINEA, Snow Mts., Oetakwa R. (*Meek*), 2 ♂, 1 ♀ type. *Exp.* 24 mm.

(4 a) *Thliptoceras xanthomeralis*, sp. n.

Head, thorax, and abdomen ochreous greyish suffused with pale rufous; antennæ ochreous white; palpi white, the 2nd joint with some blackish in front, the 3rd joint and the maxillary palpi blackish; pectus, legs, and ventral surface of abdomen ochreous white, the fore legs suffused with brown in front. Fore wing pale grey tinged with red-brown, the medial area with the costa, cell and the area beyond the cell to vein 3 pale yellow; an oblique pale brown antemedial line; a rather elongate dark brown spot in middle of cell; a yellow discoidal bar, defined at sides by rather diffused brown bars; postmedial line brown, rather oblique to vein 3, then bent inwards to below angle of cell and erect to inner margin; a fine reddish brown terminal line; cilia yellowish white. Hind wing yellowish white, the basal area tinged with brown, the terminal area pale grey; an oblique brown discoidal bar; postmedial line brown, arising at vein 6, bent outwards between veins 5 and 2, then inwards to below angle of cell and sinuous to above inner margin; a reddish brown terminal line; cilia yellowish white. Underside yellowish white; fore wing with the terminal area suffused with brown, the markings as above but without the antemedial line and with brown streak below the cell on medial area; hind wing with discoidal lunule defined by brown, the postmedial line as above, the terminal area suffused with brown to below vein 4 and in submedian interspace.

Ab. 1. ♀. Wings more uniformly tinged with yellow.

*Hab.* BR. C. AFRICA, Mt. Mlanje (*Neave*), 6 ♂, 6 ♀ type. *Exp.* 20-24 mm.

(5 d) *Thliptoceras xanthoperalis*, sp. n.

White; head, thorax, and abdomen tinged with brown; palpi banded with chrome-yellow. Fore wing white, the basal area tinged with chrome-yellow; the disk irrorated strongly with fuscous; an indistinct curved white postmedial line defined by fuscous with a chrome-yellow spot on costa and spots beyond it on costa and in submedian interspace; four terminal yellow streaks on the veins towards apex with some fuscous irroration between and below them; cilia fulvous brown chequered with white. Hind wing white, tinged with brown towards termen; a fine interrupted dark terminal line.

*Hab.* SURINAM, Onoribo, Paramaribo (*Ellacombe*). *Exp.* 14 mm. Types in Coll. Rothschild and B.M.

[To be continued.]

XXXI.—*A peculiar State of Development in Brachydesmus (Myriapoda—Polydesmoidea).* By HENRY W. BRÖLEMANN (of Pau, Basses-Pyrénées, France).

My colleague, Richard S. Bagnall, of Penshaw, recently accorded me the advantage of examining some Myriapods collected by himself, including a male representative of the family Polydesmidae, which appeared to him to be of special interest, and which was taken at Oxford in a mole's nest, together with some other Polydesmids identified (by Bagnall) as *Brachydesmus superus*, Ltz. (both sexes).

The specimen here spoken of is undoubtedly referable to the same genus, *Brachydesmus*, as shown by the shape of the carinæ, etc.; but, although probable, it is difficult to decide as to whether it should be ascribed to Latzel's species or not, as it possesses only 18 body-segments, thus being at the larval stage known as Pullus VI.

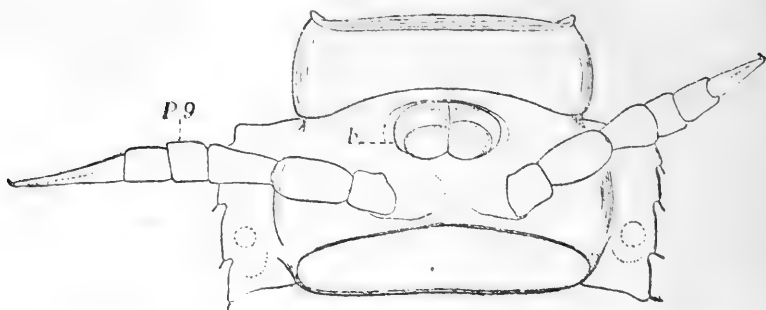
To readers not familiar with the growth of Polydesmids, it might be mentioned that the stage Pullus VI., which is the one before the last for Polydesmids having 20 body-segments, is actually the last larval stage for those provided only with 19, as in the case of *Brachydesmus*. It is a well-known fact that the sexually (and specifically) modified 8th pair of limbs of the male Polydesmids are far from having acquired their normal form in the larva. Until the last moult these organs are to be seen as two low semi-cylindrical buds (fig. 1) pressed closely together and scarcely protruding from the coxal opening located in front of the 9th pair of legs, which latter are normal ambulatory legs.

When isolated and properly prepared, it is possible to detect in these buds some darker, more thickly chitinized regions still destitute of any definite outline; such are at least the only differentiations that have ever been mentioned by authors acquainted with the subject.

It was therefore greatly surprising to come across an utterly different structure in the immature male *Brachydesmus* forming the subject of this note. Instead of the low buds, a large membranous pouch-like body was found to emerge from the coxal aperture (figs. 2 & 3). This was considerably developed transversely, being apparently composed of two pouches fused together. It was gibbous anteriorly and slightly bent backwards so as to present a concave posterior surface, and situate on the apex were

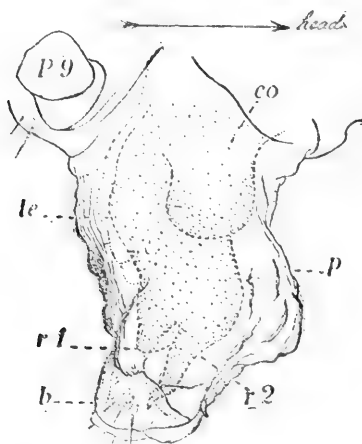
the two semicylindrical buds (*b*) spoken of as met with in normally developed immature males.

Fig. 1.



Ventral view of the 7th segment of an immature *Brachydesmus superus*, Ltz., at its last larval stage, showing the semicylindrical bud-shaped gonapods (*b*) in front of the 9th pair of legs (*P9*).

Fig. 2.



The membranous pouch (*p*) tipped with the semicylindrical buds (*b*), showing the preformed gonapods (dotted).

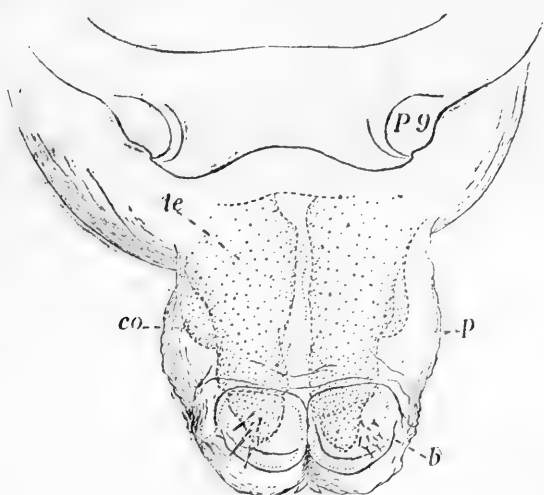
*co*=coxal process; *te*=telopodite or second joint with its posterior ridge (*r1*) and its anterior process (*r2*). From the side, *P9*=right limb of the 9th pair.

Throughout the transparent membrane of the pouch (*p*) opaque yellow central masses assuming the shape shown in



figures 2 and 3 (dotted parts) could easily be seen. Their development was so advanced that two joints could be distinguished; a basal lateral joint (*co*), the outline of which is very distinct, is the equivalent of the distal coxal process, with the inner face of which articulates the second joint or telopodite (*te*); the base of the coxa dipping in the general cavity of the body is hidden from view. The second joint is almost entirely visible—that is, as far as not concealed by the coxal process. When viewed from the side (fig. 2) it is represented by a rather stoutish stem feebly arched backwards and with a slightly concave posterior surface.

Fig. 3.



The same; posterior surface. (Same lettering as fig. 2.)

It is divided at its second third into a posterior transverse rounded ridge (*r 1*), which is scarcely protruding; and an anterior tapering, antero-posteriorly flattened process (*r 2*), which is longish and angularly directed backwards, overlapping the posterior ridge.

That these organs should be gonapods can by no means be contested; their location and structure leave no room for any other hypothesis. Moreover, should these organs be compared with the gonapods of other full-grown adult Polydesmids, a striking general resemblance will be found

between them. While in the genus *Polydesmus* (20 body-segments) most of the species show gonapods more or less deeply divided into two distinct processes, the great majority of the *Brachydesmus* species (19 body-segments) possess gonapods either undivided at all or but slightly notched, as seen in the adjoined sketches. It is even possible to trace still further homologies in the details of the telopodite. The posterior transverse ridge, for instance, is beyond doubt homologous with the pulvillum-bearing wart of the adult gonapods, and the anterior process with the secondary or tarsal ramus.

It is therefore unquestionable that we have to deal with the case of a larva provided with almost adult male copulatory organs. Such a structure is frequent and even normal with Diplopods of archaic type, such as *Colobognatha* or *Spiroboloidea*; but that it should be witnessed in the highly specialized Polydesmoidea is certainly most striking.

This case is, moreover, of considerable importance if viewed with reference to the part assumed by *Neotenia* in the evolution of Myriapods, as I have just propounded in a pamphlet now in the press ("Travaux du laboratoire maritime de Cette").

XXXII.—*Notes on Fossorial Hymenoptera*.—XXXIII. *On new Ethiopian Species of Psammocharidæ*. By ROWLAND E. TURNER, F.Z.S., F.E.S.

THE study of the Psammocharidæ is much complicated by the strong sexual dimorphism in many groups, by the absolute unreliability of colour distinctions in many species, and by the variability of neurulation characters in the same species within certain limits. As the sexes are very rarely taken coupled, certainty as to the pairing is extremely difficult where the sexual dimorphism is strongly developed, but in some cases the neurulation affords a good clue. The points of neurulation most liable to variation are the point of origin of the cubitus of the hind wing and the comparative length of the abscissæ of the radius; small variations in these points should not be considered as necessarily of specific importance. Colour distinctions are of far less importance, in *Hemipepsis glabratus*, Klug, the fulvous

markings of the thorax and abdomen disappear more or less completely in Central Africa, and reappear fully in the male of the South African form *H. spectrum*, Sm. The colour variations of *Batozonus fuliginosus*, Klug, are very striking in the female, the antennæ showing all gradations from orange to black; in specimens from Guinea the head and thorax tend to become dark ferruginous; this is also the colour in the typical Saharan form, in which the wings are dull yellow deeply margined with brown; closely allied species in India and Madagascar have the wings yellow with only a narrow fuscous margin, whereas in the common Ethiopian form the wings are wholly black with a blue sheen. Many of these colour forms are doubtless of subspecific importance, but many are merely individual aberrations.

### Genus *HEMİPEPSIS*, Dahlb.

#### *Hemipepsis iodoptera*, Stål.

*Hemipepsis iodoptera*, Stål, Elfvers. Svensk. Vet. Akad. Forh. xiv. p. 64 (1857).

*Salix lineaticollis*, Cam. Ann. Transvaal Mus. ii. p. 121 (1910). ♀.

This is closely related to *H. spectrum*, Sm., but the female has the clypeus much less emarginate, the angles of the pronotum less rounded, and the abdomen pruinose. In both species the striation of the median segment is fine and close, rather irregular. *H. iodoptera* usually has a black transverse mark on the vertex.

#### *Hemipepsis fallax*, Sauss.

*Mygymia fallax*, Saussure, Distant, Natural. Transvaal, p. 221 (1892). ♂.

*Mygymia hottentotta*, Saussure, Distant, Natural. Transvaal, p. 220 (1892). ♀. (Nec Taschenberg, 1869.)

*Salix transvaaluanus*, D. T. Catal. Hymen. viii. p. 242 (1897).

Dalla Torre treats *fallax* as the male of *distanti*, Sauss., but I consider that this is incorrect. From the description and figure *distanti* seems to me to be a synonym of *H. tami-sieri*, Guér.

#### *Hemipepsis lacustris*, sp. n.

♀. Nigra; capite pronotoque fusco-ferrugineis; antennis pedibusque ferrugineis; tergitis 2-5 apice et fascia longitudinali

mediana fuscis, utrinque macula maxima flavo-brunnea; sternilis brunneo-ferrugineis; alis nigro-cæruleis.

♂. Feminæ similis; tergitis duobus basalibus læte flavis, apice anguste ferrugineo-marginatis, tertio sequentibusque ferrugineis. Long., ♀ 22 mm., ♂ 15 mm.

♀. Clypeus broadly rounded at the sides, the middle of the apical margin almost transverse, very feebly sinuate, a row of five or six large punctures, each of which has a long black hair, before the apical margin; labrum deeply incised, with a fringe of long fulvous hairs. Interantennal prominence well developed, rounded at the apex. Antennæ stout, the second joint of the flagellum about half as long again as the third; posterior ocelli a little further from the eyes than from each other; eyes separated on the vertex by a distance about equal to the length of the two basal joints of the flagellum. Pronotum very broadly rounded at the anterior angles, not transverse; scutellum convex, not strongly compressed laterally. Median segment transversely striated, the striæ strong, regular, and widely separated, stronger towards the apex than at the base; the posterior slope almost vertical, abrupt, the surface smooth at the apex, but with strong striæ at the base; the tubercles at the basal angles of the segment obsolete. Abdomen opaque; sixth tergite sparsely clothed with long black and fulvous hairs; transverse groove of the second sternite situated near the base. Comb of the fore tarsi stout, but not long; hind tibiæ spinose, the serration rather feebly developed. Third abscissa of the radius much longer than the first and second combined; second recurrent nervure received at the middle of the third cubital cell; submedian cell much longer than the median; cubitus of the hind wing originating much before the transverse median nervure.

♀. Antennæ stout, nearly as long as the whole insect, the second and third joints of the flagellum subequal. Anterior margin of the clypeus transverse, labrum very shallowly emarginate. Transverse groove of the second sternite very feeble; apical sternite very broadly rounded at the apex; the penultimate with a longitudinal ridge on each side ending in a short spine, the space between the ridges shining, the remainder of the sternites pubescent.

*Hab.* Semliki Plains, near southern shore of Lake Albert, 2200 ft. (*S. A. Neave*), November 1911.

Easily distinguished from *glabratus* and its allies by the much more coarsely striated median segment.

More nearly allied to a South African species which I have identified with some doubt as *H. hottentota*, Tasch. It differs from this in the colour of the abdomen and very strongly in the much stouter antennæ of the male, in which point it closely resembles *H. brunniceps*, Tasch. A female in the British Museum, apparently identical with the type, is labelled "Interior of South Africa," and another "Gaboon."

*Hemipepsis glabratus*, Klug.

*Pompilus glabratus*, Klug, Symbol. physic., Dec. 1834, t. 38, fig. 1. ♀.

This species occurs over most of the northern portion of the Ethiopian region.

*Hab.* Ambukol (*Klug*); Tuma and Mankuma, Northern Territories of the Gold Coast (*J. J. Simpson*), May 1913.

Forms which I think must be treated as subspecies of *glabratus* occur throughout the Ethiopian region. These are:—

1. *Hemipepsis anchietæ*, Rad.

*Priocnemis anchietæ*, Rad. Journ. acad. sc. math. Lisboa, viii. p. 213 (1881). ♀.

*Hab.* Senaar (*Major Penton*); British East Africa, Kibwezi, 3000 ft. (*S. A. Neave*), April 1911; German East Africa, Usanga, 3500–4500 ft. (*S. A. Neave*), December 1910; Nyasaland, Mlanje (*S. A. Neave*), July 1913; Karonga district, Valley of N. Rukuru (*S. A. Neave*), July 1910; Katanga, Lufira, 3500 ft. (*S. A. Neave*), August; N.E. Rhodesia, Niamadzi River, 2000 ft. (*S. A. Neave*), August 1910; Rhodesia, Lonely Mine (*H. Swale*), December 1914; Angola (*Welwitsch*); Angola, Lepi (*E. Robins*).

The abdomen, except the apical segment, in the female, and at least the two basal segments in the male are black in this form, usually also the mesonotum and scutellum.

2. *Hemipepsis spectrum*, Sm.

*Mygnumia spectrum*, Sm. Cat. Hym. B.M. iii. p. 187 (1855). ♂.

*Priocnemis hirsutus*, Saussure, Distant, Natural. Transvaal, p. 216 (1892). ♂.

*Mygnumia depressa*, Saussure, Distant, Natural. Transvaal, p. 219 (1892). ♀.

*Hab.* Throughout S. Africa from Basutoland to the

Zambesi; Nyasaland, S.W. of Lake Chilwa (*S. A. Neave*), January 1914.

The range apparently overlaps that of *H. anchietæ* in N. Rhodesia and Nyasaland.

Very nearly related to the three above forms, but differing in having the clypeus a little less strongly emarginate and the hind tibiæ less strongly serrate, is *Hemipepsis insignis*, Sm., the locality for which is given as W. Africa.

*Hemipepsis quadraticollis*, sp. n.

♀. Nigra; capite, antennis, pronoto pedibusque fulvis; tergitis 2-6 flavis, apice anguste ferrugineo-marginatis, 2-4 in medio longitudinaliter ferrugineo-fasciatis; sternitis brunneo-ferrugineis; alis fusco-violaceis.

♂. Feminae similis.

Long., ♀ 12 mm., ♂ 9 mm.

♀. Clypeus widely and very shallowly emarginate at the apex; labrum broadly rounded, not incised. Interantennal prominence well developed, rounded at the apex and divided by a longitudinal sulcus which extends to the anterior ocellus. Antennæ stout and rather short; eyes separated on the vertex by a distance not quite equal to the combined length of the second and third joints of the flagellum; the posterior ocelli nearer to each other than to the eyes. Anterior margin of the pronotum transverse, the angles not rounded, the sides parallel. Median segment without lateral tubercles, very finely and closely transversely striated, sparsely clothed with black hairs; the posterior slope steep, but not vertical, not sharply divided from the dorsal surface, which is distinctly convex. Abdomen subopaque, sparsely covered with delicate pubescence; the ventral surface more shining and sparsely punctured. Hind tibiæ feebly serrate, without spines. Cubitus of hind wing originating well before the transverse median nervure.

♂. Antennæ not very stout, rather short, not longer than the head, thorax, and median segment combined; second and third joints of the flagellum subequal. Apical sternite very broadly rounded, the penultimate with a short longitudinal carina ending in a short spine on each side.

*Hab.* Bweya, Uganda (*C. G. Gowdey*), May 1913, 1 ♀; Valley of Kafu River, Unyoro, 3400 ft. (*S. A. Neave*), December 1911, 2 ♂♂.

This little species is closely related to *iodoptera*, Stål, but differs in the much smaller size, the colour of the abdomen,

the finer striation and much less abruptly truncate median segment, and in the shorter antennæ of the male.

*Hemipepsis vespertilio*, Gerst.

*Pompilus vespertilio*, Gerst. Monatsber. Königl. Akad. Wiss. Berlin, p. 511 (1857). ♂.

*Pompilus vespertilio*, Gerstaecker, Peters, Reise n. Mossambique, Zool. v. p. 484 (1862). ♂.

*Mygminia belzebuth*, Saussure, Distant, Natur. Transvaal, p. 218 (1892). ♀ ♂.

A common East African species ranging from the Orange Free State to Uganda. Gerstaecker mentions only one tooth on the tarsal unguis in his description, but there can be no doubt that his description applies to this species and that he overlooked the basal tooth. The clypeus of the male is usually black, but sometimes fusco-ferruginous as in the type.

*Hemipepsis refulgens*, sp. n.

♀. Nigra; femoribus, tibiis tarsisque læte fulvis; alis splendide viridi-aeneis; tibiis posticis haud serratis.  
Long. 19 mm.

♀. Clypeus broadly and very shallowly emarginate, the labrum very shallowly emarginate in the middle. Eyes separated on the vertex by a distance not quite equal to the length of the second joint of the flagellum; posterior ocelli nearer to each other than to the eyes. Pronotum rounded at the anterior angles and very broadly arched posteriorly; scutellum almost flat, postscutellum slightly convex. Median segment with a large rounded tubercle on each side at the base, coarsely transversely striated, the posterior slope oblique, not sharply separated from the dorsal surface and also transversely striated; the sides of the segment indistinctly obliquely striated. Sixth tergite sparsely clothed with long black hairs; transverse groove of the second tergite shallow and situated close to the base. Basal joint of fore tarsi with a very short comb; hind tibiæ with a row of short spines, not serrate, tarsal unguis with two teeth. Discoidal spot distinct, first recurrent nervure received at the apex of the second cubital cell, third at one-third from the base of the third cubital cell; radial cell oblique at the apex, cubitus of hind wing interstitial.

*Hab.* Buamba Forest, Semliki Valley, Uganda Protectorate, 2300–2800 ft. (*S. A. Neave*), November 1911.

This has a strong superficial resemblance to *Cyphononyx nigrita*, Fabr., which occurs in the same locality.

*Hemipepsis vestitipennis*, sp. n.

♀. Rufo-ferruginea, mesopleuris, sterno, coxis intermediis posticisque, segmento mediano lateribus abdomineque nigris; segmento mediano supra fusco-ferrugineo; abdomine segmentis duobus apicalibus rufo-ferrugineis, tergito quinto basi nigro, tergito quarto apice macula transversa utrinque rufo-ferruginea; alis dimidio basali flavis, pilis rufo-ferrugineis vestitis, dimidio apicali fusco-violaceis.

Long. 26 mm.

♀. Clypeus widely and shallowly emarginate at the apex; the labrum broadly rounded, almost imperceptibly sinuate at the apex. Second joint of the flagellum about half as long again as the third, the latter about two and a half times as long as its apical breadth. Eyes separated on the vertex by a distance equal to the combined length of the two basal joints of the flagellum, posterior ocelli as far from each other as from the eyes. Pronotum feebly rounded at the anterior angles, almost transverse in front; post-scutellum strongly convex, subtuberculate in the middle. Median segment without lateral tubercles, distinctly convex, much broader than long, abruptly truncate posteriorly; transversely striated, the striae not very close, low and rather obscure at the base, higher at the apex. Abdomen shining, almost smooth, with a few scattered punctures on the apical segments; sixth tergite sparsely punctured, sparsely clothed with black and fulvous hairs; the transverse groove of the second sternite situated near the base. Radial cell very broadly truncate at the apex, the fourth abscissa of the radius shorter than the second, the third as long as the first and second combined; second recurrent nervure received at two-fifths from the base of the third cubital cell; submedian cell much longer than the median; cubitus of hind wing originating considerably before the transverse median nervure. Spines of the hind tibiae strong; the serration distinct, but not strongly developed; spines of the tarsi short; the longest of the hind calcaria much less than half as long as the hind metatarsus. Tarsal unguis with two teeth.

*Hab.* Bohotle, Somaliland (*A. F. Appleton*).



In the colour of the wings this resembles the beautiful *H. sericeipennis*, Bingh., but is quite distinct in the form of the clypeus, pronotum and joints of the flagellum, as well as in size and colour. From *H. barbara*, Lep., it differs in the form of the clypeus, in the more slender flagellum, in the much more extensive fuscous area of the wings, and in details of neurulation.

*Hemipepsis mlanjensis*, sp. n.

♀. Nigra; capite, antennis, pronoto, mesonoto, scutello, post-scutello, segmento abdominali sexto, pedibusque, coxis exceptis fulvis; alis flavis, apice anguste fuscis.

Long. 18 mm.

♀. Clypeus very shallowly emarginate anteriorly. Antennæ stout, the second joint of the flagellum longer than the third by about one-quarter. Eyes slightly divergent towards the clypeus, separated on the vertex by a distance equal to the length of the second joint of the flagellum, posterior ocelli a little nearer to the eyes than to each other. Pronotum very widely arched posteriorly; postscutellum feebly convex. Median segment without lateral tubercles, rounded posteriorly, not truncate, regularly transversely striated. Transverse groove of the second sternite situated just before the middle; sixth tergite closely microscopically punctured, with sparse setigerous punctures intermingled. Comb of fore tarsi short, the metatarsus with seven spines; serration of the hind tibiæ only feebly developed. First recurrent nervure received just before the apex of the second cubital cell, second just beyond one-third from the base of the third cubital cell; third abscissa of the radius as long as the first and second combined. Discoidal spot distinct. Cubitus of hind wing received just before the transverse median nervure, almost interstitial.

*Hab.* Nyasaland, side of Mt. Mlanje, 3000–4000 ft. (*S. A. Neave*), December.

The tarsal ungues are not normal, being bifid at the apex, the inner division truncate; on the middle of the ungues there is a small tooth as in *Cryptochilus*, but no basal tooth as in *Hemipepsis*. The only species described in which the ungues are at all similar is *Hemipepsis unguicularis*, Kohl (1913), but in that species the wings are blue-black; the inner division of the bifid ungues pointed and the median both oblique and strongly developed so that the ungues appear to be trifid. The fuscous margin of the wings in the

present species begins at the apex of the radial cell and thence narrows rapidly.

*Hemipepsis heteroneura*, sp. n.

♀. Fulva; alis flavo-hyalinis, venis ferrugineis.  
Long. 14-17 mm.

♀. Clypeus transverse at the apex, minutely punctured; a few large punctures before the apex, each bearing a long fulvous hair. Interantennal prominence not well developed, second joint of the flagellum half as long again as the third, the latter more than three times as long as its apical breadth. Eyes separated on the vertex by a distance about equal to the combined length of the two basal joints of the flagellum, the posterior ocelli nearly twice as far from the eyes as from each other. Anterior angles of the pronotum broadly rounded, scutellum and postscutellum convex, not compressed laterally. Median segment rounded, gradually sloped, with an obscure longitudinal impressed line, the dorsal surface very delicately and indistinctly transversely striated. Abdomen shining, but not highly polished, the sixth tergite thinly covered with long fulvous hairs; impressed transverse line of the second tergite situated beyond one-third from the base. Spines of the fore tarsi very short and slender; hind tibiae strongly serrate and with a few short spines; tarsal unguis with two teeth. Radial cell obliquely truncate at the apex, third abscissa of the radius about as long as the first and second combined, first recurrent nervure received just beyond three-quarters from the base of the second cubital cell, second at one-third from the base of the third cubital cell. Discoidal spot very distinct. Submedian cell much longer than the median; cubitus of the hind wing almost interstitial.

*Hab.* Uganda Protectorate, Western Ankole, 4500-5000 ft. (*S. A. Neave*), October 1911.

This is a rather aberrant species owing to the position of the first recurrent nervure; but in other characters (such as the presence of a discoidal spot, the bending of the cubitus beyond the second transverse cubital nervure, and in the bidentate unguis) it is an undoubted *Hemipepsis*. Other species showing the same aberrant character in the neururation are *H. hilaris*, Sm. (*Pompilus h.*), *H. similipicta*, Sauss. (*Priocnemis s.*), *H. hildebrandti*, Sauss. (*Priocnemis h.*), and *H. nesarchus*, Schulz, to which latter the present species is more nearly related.

*Hemipepsis (Tetraodontonyx) titan*, sp. n.

♀. Nigra; alis nigro-cæruleis.

♂. Feminae similis.

Long., ♀ 34-40 mm., ♂ 30 mm.

♀. Clypeus broadly and shallowly emarginate, labrum rounded at the apex. Eyes separated on the vertex by a distance very slightly exceeding the length of the second joint of the flagellum; posterior ocelli nearer to each other than to the eyes. Antennæ stout; vertex somewhat swollen behind the ocelli. Pronotum rounded anteriorly, very broadly arched posteriorly; mesonotum longitudinally subcarinate in the middle on the posterior half; scutellum and postscutellum moderately convex. Median segment short, without lateral tubercles at the base, coarsely transversely striated; the posterior truncation almost vertical, its surface smooth on the apical half; the dorsal surface distinctly convex. Sixth tergite clothed with black hairs; transverse groove of the second sternite situated distinctly behind the middle of the segment. Basal joint of the fore tarsi with a comb of short stout spines; hind tibiæ with a well-defined ridge above, on which are a few small spines, not serrate. Calcaria of the hind tibiæ exceeding one-third of the length of the basal joint of the hind tarsi. Tarsal joints strongly spinose beneath; tarsal ungues with four teeth and with a comb of long setæ.

♂. Clypeus longer and narrower than in the female, second joint of the flagellum much shorter, very little longer than the third. Hind tibiæ and tarsi clothed rather densely with very short black hairs, the tarsal joints somewhat flattened; the ungues without a comb of long setæ. Postscutellum more strongly convex than in the female, almost subtuberculate. Groove of the second sternite shallow, situated near the base. Neuration as in *Hemipepsis*; radial cell broadly truncate at the apex; second recurrent nervure received at one-third from the base of the third cubital cell, very feebly curved.

*Hab.* Mlanje, Nyasaland (*S. A. Neave*), November and January; N.E. Rhodesia, between Fort Jameson and Lundazi, 4000 ft. (*S. A. Neave*), June; Portuguese East Africa, Busi River (*C. F. M. Swynnerton*), December; Uganda, Mt. Maroto, 3700 ft. (*W. P. Lowe*), January; British East Africa, Crater Lake, N.W. of Meru, 5700 ft. (*S. A. Neave*), February.

This is allied in structure to *H. heros*, Guér.; in both species the sixth sternite of the male has four longitudinal carinæ, excluding the raised lateral margins, the outer pair ending in a small spine and with a large tubercle at the base, but the seventh sternite is broadly rounded at the apex in *titan* and truncate in *heros*. I do not think that *titan* is a mere colour variety, though *heros* varies much in colour, especially on the thorax; but it may be a local race.

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XXXIII.—*The Homologies of the Anal Plate in Antedon.*  
By F. A. BATHER, D.Sc., F.R.S.

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OF late years, since rigid distinctions were first drawn between the various plates in the posterior interradius of Palaeozoic Crinoids, the plate which appears, migrates, and disappears in the posterior interradius of the larval *Antedon*, and is called the anal plate, has been regarded as homologous with the plate generally known as anal  $x$  (the brachial of Bather, 1890) in the Crinoidea Inadunata and Flexibilia. Dr. Austin Hobart Clark, however (1912, Journ. Washington Acad. Sci. ii. pp. 309–314, and 1915, Monogr. Existing Crinoids, vol. i. part 1, pp. 331–339 \*), attempts to prove that the anal of *Antedon* is homologous with the radianal (Bather, 1890). A plate presumed to be the same occurs in the young of *Promachocrinus*. The representative of anal  $x$  is found by Dr. Clark in the posterior one of the small interradial plates occasionally observed in *Antedon* and other normal comatulid genera, while in *Promachocrinus* he would homologise it with one of the additional arm-bearing plates (pararadials, Bather, 1900).

Considering the extensive use that has been made of the anal plates in the classification of the Palaeozoic Crinoids, it seems advisable to examine Dr. Clark's arguments. But first let us recapitulate the main characters of anal  $x$  and the radianal, as seen in the Inadunata and Flexibilia.

Both of these plates are intimately connected with the

\* The references, except when otherwise stated, are to the latter work.

right posterior radius. This is universally admitted with regard to the radianal, which is in its origin the right posterior inferradial, in other words part (if not really the whole) of the radial itself. The same connection does not appear to be so generally recognized in the case of anal  $x$ , but this connection is one of the reasons that led me to give that plate the name brachianal. Facts proving the connection were published in the 'Geological Magazine' for January 1899, and summarized in Lankester's 'Treatise on Zoology,' part iii. Echinoderma, pp. 120-122 (1900).

The geological history of the radianal is briefly as follows:— It begins in Ordovician times as an inferradial \*. Then, as the posterior interradius widens, the radianal of the Dicyclic Inadunata moves to the left of the right posterior radial, and, while retaining its contact with the lower margin of that plate and with the two underlying basals, comes also into contact with anal  $x$ , if that plate be present (e. g., *Palaeocrinus* and *Botryocrinus*). In Silurian and Devonian times the widening of the interradius continues, the radianal continues to move to the left and comes into contact with a plate ( $rt$ ) which sinks down on the right side of the anal tube between  $x$  and r.post.R. (e. g., *Euspirocrinus*). This arrangement is emphasized in such Carboniferous genera as *Poteriocrinus*. In some later forms of the same group the radianal may stretch upwards, as the body of the animal with its anal structures comes to lie on rather than in the dorsal cup; but while the other anal plates ( $x$ ,  $rt$ ) pass up beyond the limits of the cup, the radianal invariably retains that connection with the lower slope of r.post.R. which bears witness to its inferradial origin. This arrangement is best shown in some North-American and British species of *Ulocrinus*, and I have recently discussed them in regard to this feature †. A parallel

\* An inferradial is the lower half of a transversely bisected radial, the upper half being distinguished as superradial. These terms were chosen to indicate the truly radial nature of these plates. O. Jaekel and A. H. Clark call the inferradials "subradials." To this term there are two objections. First, it implies that the plates are not radial elements, but independent plates developed below the radials. This, however, does not appear to be the intention of those two authors. Secondly, the term subradial was used for the basals by De Koninck, and Dr. Clark seems to have forgotten (p. 104) that in this use De Koninck was followed by several American writers of repute down to the end of the nineteenth century. As to possible homologies of the inferradials, see Bather, 1900, 'Treatise on Zoology,' iii. p. 112, and 1913, Bull. Mus. Ottawa, i. pp. 9, 14.

† 1917, Trans. Geol. Soc. Glasgow, xvi. pp. 210-212. On p. 211, in line 4 of the middle paragraph, "left posterior basal" is a slip for "right posterior basal." Of course, RA never touches l.post.B. in any genus.

course is followed by the *Eupachycrinus* series. In many allied forms (e. g., *Delocrinus*) it is plain that the radianal had disappeared before the migration of the other anals from the cup was complete. There is no evidence that the radianal ever followed those plates outside the cup limits. It could only do so by losing its primitive morphological connection with the lower end of r.post.R., a connection which it invariably retains throughout the manifold modifications of the anal area. The fate of the radianal, as indicated by the fossils from Cambrian to Permian, is to disappear by atrophy or resorption while still below the upper margin of the dorsal cup. In the fossils from the Trias to the Pleistocene no trace of it is found.

In the Monocyclic Inadunata the history of the radianal is somewhat different. In the Pisocrinidae and their descendants it is pushed to the right of r.post.R. instead of to the left, and is eventually squeezed out of existence at the lower end of the cup; it never rises between the radials.

In the Palaeozoic Flexibilia Impinnata the radianal may assume a position abutting on anal *x*, similar to that in *Botryocrinus* (*vide supra*), or it may remain below r.post.R., or even be thrust down into the basal circlet. The essential point in the present connection is that no part of it ever rises between the radials, as in the Dicyclic Inadunata. The facts are given by Springer (1906, Journ. Geol. xiv. pp. 516-519). If any of the later crinoids, including the comatulids, are descended from the older Flexibilia, and correctly classed as Flexibilia Pinnata, then it is important to note that the radianal has not been observed in the adult of any one of them from Triassic to Recent times.

Returning to anal *x*, and confining our attention to the Dicyclic Inadunata, we find it beginning in Ordovician genera above, or partly above, or between the two posterior radials. In the last two cases it rests on the posterior basal, but if a radianal be present it abuts or in part rests also on that plate. It sinks furthest down into the cup in forms with a wide anal area, such as *Carabocrinus* and *Thenarocrinus*, or in the peculiar Gasterocomidæ, where the anus opens on the side of the cup itself. Further width is attained, especially in *Poteriocrinus* and its allies, by the sinking of right and left tube-plates (*rt* and *lt*) into the cup, the former even meeting the radianal. The extreme of this development is reached in some Lower Carboniferous genera, such as *Woodocrinus*. Then begins the consolidation of the cup and the raising of the viscera. As the rectum passes upwards, so

also does its proximal supporting plate *x*, which thus gradually rises above the radial circlet, until the two posterior radials meet beneath it (e. g., *Erisocrinus*). Thenceforward, from the Trias onwards, the identity of anal *x* is lost in the general plating of the adult anal tube when such a structure exists.

Apart from all hypothesis, the historical facts make it clear that anal *x* and the radianal are structures differing in origin and development and ultimate fate. While anal *x* has supra-radial relations, those of the radianal are inferradial. While anal *x* finally passes up out of the cup, the radianal is resorbed when within the cup limits.

If, then, in recent crinoids a plate is observed in young stages between the posterior radials, and then migrating upwards beyond the limits of the cup, it is natural, on the theory of recapitulation, to regard that plate as *x* rather than as the radianal.

Let us now consider Clark's arguments.

First, as to the anal of *Antedon* and similar forms. He says this is more closely connected with r.post.R. than with l.post.R. But this is just what I have always insisted on as the case with anal *x* in the Ordovician and Silurian Inadunata. If this tendency of the *Antedon* anal to keep to the right "is a fact of the very highest importance," then I welcome it as confirming the views I have always expressed concerning the true anal *x*.

Clark then passes to the anal in the young of *Promachocrinus* (p. 332). First he describes it as arising "in the rhombic area between the corners of the basals and orals" before any of the radials appear. That is to say, it lies in the right posterior radius. "Soon afterward the [r.post.] radial appears, just to the right of and in line with" the anal plate. This radial grows faster than the anal and gradually "surrounds" it, so that the anal "comes to lie in a deep concavity in the side of the radial." Later the r.post. "radial extends itself beneath the anal and the concavity becomes straightened out and disappears, the anal concurrently being shoved diagonally forward (to the left) and disappearing by resorption." In a subsequent paragraph it is added that the concavity which receives the anal is in "the lower left hand portion of the radial," also that the anal migrates upwards.

These facts, says Dr. Clark, "leave no room for doubt that the so-called anal of the pentacrinoid larvæ is nothing more nor less than the radianal of the fossil forms."

In the absence of figures for *Promachocrinus* it is impossible to be perfectly clear as to the precise relations of the plate in question to the right posterior radial; but the description is far from convincing me that Dr. Clark's conclusion is justified. In the well-known figures of the *Antedon* larva by W. B. warpenter and others, and in those of *Hathrometra proluxa* which Clark here reproduces from Mortensen as evidence in his favour, I find nothing to indicate that the anal is anything other than anal  $x$ . The upward migration of the plate entirely favours this view. If the anal of *Antedon* be not homologous with the plate in *Promachocrinus*, then the latter might possibly be the radianal, since it does not migrate beyond the limits of the cup. That fact, however, is scarcely conclusive, since there is a special reason for it in this genus, as will shortly appear.

Let us, then, see what further arguments Dr. Clark has to offer. "Since," he writes, "the radianal is represented in the pentacrinoids of the comatulids we should expect also to find in the posterior interradius a second plate which we could with a reasonable degree of probability identify as the representative of the plate known as anal  $x$ ; and such a plate actually occurs." This, of course, would be almost conclusive; but the statement needs careful checking.

First, consider the facts adduced for genera with five radials, as in *Antedon*. Wyville Thomson (1865, Phil. Trans. p. 540) "in one or two cases observed" in *Antedon bifida*, "about the time of the first appearance of the anal plate, a series of five minute rounded plates developed interradially between the lower edges of the oral plates and the upper edges of the basals." The fate of these plates is uncertain. Thomson himself identified them with certain perisomic interbrachials of the adult, but P. H. Carpenter (1884, Chall. Rep. p. 40) doubted this, and regarded them as true interradians, ultimately resorbed in *Antedon*, but homologous with the permanent interradians of *Thaumatoocrinus*. With these plates A. H. Clark (p. 335) homologizes five plates which appear in *Comactinia* (species not stated) at the time of formation of the first primibrachs ( $IBr_1$ ) and lie on the shoulders of the radials at such a height that their upper halves are between the  $IBr_1$ . In a single specimen of *Comactinia meridionalis* (p. 317, fig. 412) each such plate was surmounted by two others. In *Comatilia iridometriformis* (of rather later stage, pl. ii. figs. 528, 529) a "large rounded" plate rests in each interradius above the interbrachial processes of the radials.



If these plates in *Comactinia* and *Comatilia* are homologous with those first observed by Thomson in *Antedon bifida*, then they seem to support Thomson's interpretation of those plates. Further, plates occupying such a position in the adults of Palaeozoic crinoids, or in such Mesozoic genera as *Guettardicrinus* and *Uintacrinus*, are no longer called "inter-radials" but "interbranchials," and are not regarded as homologous with the true interradians of such forms as the Rhodocrinidae. Consequently there does not seem to be good reason for regarding such plates in the ordinary comatulid larva as homologous with true primary interradians. Their late appearance in development also suggests that they do not represent plates of former importance in the cup. Even if these plates were primary interradians, they would not, in my opinion, have any bearing on the anal question. Anal  $x$  is a characteristic plate of the Inadunate Crinoids—in other words, of those crinoids which are devoid of true interradians or of any interbranchially situate cup-plates in interradii other than the posterior. Whatever anal  $x$  may be, it is a special plate developed or adapted for the widening of the anal area and the support of the rectum. The same is the case with the corresponding plate in the Adunata and the Flexibilia. There is no reason for regarding it as one of five primary interradians, retained while the other four have disappeared. Consequently the existence of plates, whether interbranchials or true interradians, in all five interradii of certain comatulids, does not prevent us from regarding the specially developed anal plate as the homologue of anal  $x$ .

Dr. Clark's final argument, on which he lays most stress, is drawn from *Promachocrinus* and *Thaumatocrinus*. Ever since P. H. Carpenter described *Thaumatocrinus renovatus* in 1884 there has been a tendency to regard the plate in the posterior interradius, which supports a short somewhat arm-like process, as an anal plate. It is, however, one of five similar plates, each separating the adjacent radials, and therefore, so long as attention was confined to the original specimen, all to be regarded as true interradians. Dr. Clark still so regards them, and at the same time homologizes the posterior one with anal  $x$ . That homology is open to the same objections as have just been raised in the case of the supposed interradians of the ordinary comatulids.

Dr. Clark's own work, however, by putting a new complexion on *T. renovatus*, has made his homology even more difficult of acceptance. He has shown, in the first place, that *T. renovatus* is the young of the species later described

as *Promachocrinus abyssorum*. The process borne by the posterior plate is indeed a developing arm, and Clark suspects "that smaller arms borne on the other interradians have been lost. . . . During growth the posterior interradian arm of *Thaumatoocrinus* becomes reduplicated on all the other interradian plates, and all of the five interradian arms gradually increase to the size of the five primary arms so that the 10-armed *Promachocrinus abyssorum* results" (p. 338). It follows from this that the supposed interradians of *Thaumatoocrinus*, including the posterior one or supposed anal, are of precisely the same nature as the five arm-bearing plates which in *Promachocrinus* have been added to the five normal radials of the ordinary comatulid. Dr. Clark calls all these plates "interradians," a term which suits his argument, but which scarcely seems justified.

In 1900 (Lankester's 'Treatise on Zoology,' iii. p. 150) I suggested that these "interradian radials" were of the same nature as the arm-bearing plates in the cup of the Monocyclic Inadunata *Calycanthocrinus* and the Catilloocrinidae, for which plates Jaekel in 1895 had devised the excellent term "pararadials." Dr. Clark now tells us how the pararadials of the Promachocrinidae develop. They "arise very early in life and are from the first equal in height to the radials. They are probably . . . best interpreted as a sort of lateral budding from, or a delayed reduplication of, the radial to the left. As the radials move apart [the pararadials] continue to broaden, and their development in all ways is proportionate to their breadth as compared with the breadth of the normal primary radials" (p. 337). The development of the arms which they support bears a similar relation to the arms borne by the normal radials. The opinion that each pararadial is in a sense derived from the radial to the left of it is confirmed by various facts. Thus the posterior pararadial always maintains "a closer relation with the" left posterior radial than with the right posterior (p. 336). In some thirty 6-rayed specimens of *Promachocrinus* studied by Dr. Clark the supernumerary ray is in all cases but two inserted to the right of the left posterior radial, and receives its food-groove from the groove-trunk leading to that radial (p. 338).

The posterior pararadial appears to originate slightly before the others; in the original specimen of *Thaumatoocrinus renovatus* its arm was more developed, and, as just stated, it is sometimes the only one to be formed. These facts are very simply explained as due to the relatively greater widening of the posterior interradius by the pressure of the rectum.

It is not necessary to suppose, as Dr. Clark does, that the posterior pararadial represents a phylogenetically persistent anal  $x$ , which subsequently is reduplicated in the other interradii.

The facts given by Dr. Clark seem to me to show that the pararadials of the Promachocrinidae are really of radial origin. There is no more reason to regard them as interradials than there would be in the case of the Catillocrinidae. A similar proliferation of arm-bearing, or, rather, brachiole-bearing, elements is seen in many Cystidea Rhombifera, e. g., *Cheirocrinus* (Bather, 1913, Trans. R. Soc. Edinburgh, xlix. p. 446, figs. 52-55).

Dr. Clark, it is true, has some ingenious remarks, apparently intended to show that there is no real difference between a radial and an interradial. To quote from his paper of 1912 (p. 312): "while a plate if situated below the ventral edge of the perisomic surface may give rise to a simple series of more or less similar plates running up to the edge of the ventral surface, and possibly continued further along the anal tube, the same plate if situated just at the ventral surface will give rise to an arm or a group of arms exactly like those arising from the radials. The character of the ossicles following a plate is not determined so much by the character of the plate itself as by its position in reference to the boundary between the dorsal and ventral surfaces of the animal." This seems to me hopelessly inconsistent with well-known facts. On the one hand, there are plenty of genera in which the anal is on a line with the radials and yet does not give rise to an arm (e. g., *Hexacrinus*); on the other, there are genera in which some radials, though on a level with the others, cease to bear arms (e. g., *Tribrachio-crinus*, *Sycocrinus*).

We have, then, found no reason for accepting Dr. Clark's statement that a "representative of anal  $x$  actually occurs" along with the plate which he calls the radianal. Consequently that argument for the radianal nature of the latter plate falls to the ground. The facts do, however, throw light on the non-migration of the anal in *Promachocrinus*, the peculiarity which, it was admitted, might conceivably encourage one to regard it as the radianal (*antea*, p. 298). Dr. Clark says (p. 337): "I have examined pentacrinoids of *Promachocrinus kerguelensis* in which both the radianal and anal  $x$  are present, the former dwindling, the latter increasing in size. They are situated side by side between the two posterior radials." Obviously the lateral growth of the

posterior pararadial (Clark's "anal  $x$ ") prevents the upward migration of the anal (Clark's "radial") and inhibits its further growth, partly by drawing on its stereom for its own supply of calcium carbonate.

We may, therefore, continue to regard the anal in the Promachocrinidae as homologous with that of the other comatulid larvae, and, in all, as the representative of anal  $x$ .

XXXIV.—*On the Arrangement of the small Tenrecidæ hitherto referred to Oryzorictes and Microgale.* By OLD-FIELD THOMAS.

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THERE has long been some doubt as to the distinction from each other of the two genera *Oryzorictes* and *Microgale*, the latter of which I described in 1882, twelve years after Grandidier had described the former, and in consequence of this doubt the generic allocations used by Forsyth Major in describing the many new forms of Tenrec-shrews which he discovered during his successful expedition of 1894–96 have never been revised or confirmed.

I have now had an opportunity of going over the Museum material of the group with a view to putting its generic arrangement more in order than it was left by Dr. Major, who never completed the admirable work he began on it. No additional specimens have been received since his collection came, but the fine series he obtained, combined with those previously collected by Mr. Deans Cowan and worked out by me, have enabled me to obtain some idea of the natural arrangement of the group.

I find that it may be divided into five genera, whose chief characteristics are set out in the following synopsis:—

- A. Claws not markedly fossorial, the anterior not or little longer than the posterior. Canines not dominant, commonly low and blund, and never surpassing the anterior incisors.
  - a. Molars with marked internal lobe. Incisors diminishing backwards, the canine considerably longer than  $i^3$ . Muzzle little elongated, the teeth touching each other. Fore-claws not longer than hind.

- a*<sup>2</sup>. Skull heavily built. Interorbital region parallel-sided. A high lambdoid crest present. Zygomatic process of squamosal prominent, projecting laterally beyond brain-case. Teeth stout and heavy; posterior secondary cusps reduced or absent ..... 1. *Nesogale*, g. n.
- b*<sup>2</sup>. Skull papery; tapering forwards evenly from the brain-case. Lambdoid crest not or scarcely developed, and not interrupting the smooth even profile of the skull. Zygomatic process of squamosal minute, surpassed by the lateral inflation of the brain-case. Teeth light and delicate; posterior secondary cusps well developed .... 2. *Microgale*, Thos.
- b*. Internal basal lobe of molars obsolete. Incisors subequal, the bicuspid canine little surpassing <sup>3</sup>. Muzzle long and slender, the teeth widely spaced. Fore claws longer than hind ..... 3. *Leptogale*, g. n.
- B*. Claws markedly fossorial, the third anterior twice the length of the third posterior. Canines dominant, always surpassing the anterior incisor; their secondary cusp quite small.
- a*. Pollex absent. Fur ordinary. Skull less broadened behind ..... 4. *Nesoryctes*, g. n.
- b*. Pollex present. Fur velvety, mole-like. Skull more broadened behind ..... 5. *Oryzorictes*, Grand.

In the following notes the more important generic characters are not necessarily repeated, as they have been already given in the synopsis above:—

#### 1. NESOGALE, g. n.

Genotype. *N. dobsoni* (*Microgale dobsoni*, Thos.).

Other species:—*talazaci*, Maj.

A larger heavier form, related to *Microgale*, but with more powerful teeth and heavily ridged skull. In side view the skull is peculiar for the sinuosity of its profile, the high transverse occipital ridge being succeeded anteriorly by a concavity, in front of which again there is a marked convexity whence the profile runs straight to the tip of the nasals, or is even slightly concave or sinuous. Below there is a marked ridge connecting the postglenoid processes with the entopterygoids, the ectopterygoids being practically obsolete.

Teeth essentially like those of *Microgale*, but stouter and

heavier throughout, and the posterior basal cusp of the incisors and canines is reduced or absent. The anterior incisors are always longer than the canines.

A specimen in spirit of *N. dobsoni*, obtained by Dr. Major, has got an incrassated tail, but whether this is normal or seasonal I am not able to state.

## 2. MICROGALE, Thos.

Genotype. *M. longicaudata*, Thos.

Other described forms :—

*cowani*, Thos.  
*cowani nigrescens*, Ell.\*  
*crassipes*, M.-Edw.  
*longirostris*, Maj.  
*majori*, sp. n. (infra).  
*pusilla*, Maj.  
*taiva*, Maj.  
*thomasi*, Maj.

The characters of the teeth and the smoothly rounded profile of the skull, uninterrupted by any ridges or sinuosity, are sufficiently indicated in the figures in the original description †.

As noted below, the longer-tailed species, *longicaudata* and *majori*, have the tail modified for prehension terminally, and the shorter-tailed forms, *cowani* and *thomasi*, not. But the intermediate-tailed *taiva* and *pusilla* are as intermediate in the structure as in the length of the tail, and show that no superspecific value can be attached to the modification.

The animal called *M. c. nigrescens* by Elliot is undoubtedly a mere melanism of a species which Dr. Major got in some numbers and which he referred to *M. cowani*. Several intermediate examples between the wholly brown and wholly black forms occur in our series, with a greater or less extent of the median dorsal area black.

But what its proper determination is still remains rather doubtful, as no less than three different points bearing on the question need further material for their elucidation. Firstly, what variation is found in typical *M. cowani*, for the type of that species differs in certain details of dentition

\* P. Biol. Soc. Wash. xviii. p. 237 (1905).

† J. Linn. Soc., Zool. xvi. p. 319 (1882).

from Dr. Major's "*M. cowani*." Secondly, what *M. crassipes*, M.-Edw., is—the measurements are not very different from those of Dr. Major's animal, though the claws would seem to be longer. And, thirdly, whether *M. longirostris*, Maj., is really different from his "*M. cowani*"; the hind foot of the type is certainly unusually long, but otherwise I can see no difference. On the whole, pending the arrival of further material, I am inclined to believe that the specimens called *cowani* by Major are not that species but are the same as his *longirostris*, of which, therefore, *nigrescens* would be a synonym. And *crassipes* may also possibly be the same animal.

The following new species was obtained by Mr. Deans Cowan with the first series of the genus, but was not then distinguished by me from *M. longicaudata* :—

*Microgale majori*, sp. n.

Allied to and of the same general proportions as *M. longicaudata*, but decidedly smaller and with less excessively long tail.

Length of skull and feet from 2–3 mm. less than in *M. longicaudata*. Colour, of a specimen skinned from spirit and therefore probably too rufous, reddish brown above and near "saya-brown" below—but without specimens skinned fresh, these colours cannot be trusted; bases of hairs everywhere dark slaty. Hands and feet brownish white. Tail very long, though not so long as in *longicaudata*, brown above, paler below.

Skull very similar in shape to that of *M. longicaudata*, but decidedly smaller. The brain-case is, however, rather more smoothly rounded, without such a marked inflation at the point where its greatest breadth occurs.

Dimensions of the type, those of the type of *longicaudata* in brackets :—

Head and body 60 mm. (67); tail 109 (158); hind foot 16 (18·2); ear 13 (15).

Skull: greatest length 20·5 (22); condylo-basal length 19·6 (20·9); greatest breadth across brain-case 9 (9·6); palatal length 9·4 (10·5); front of canine to back of  $m^3$  6·8 (7·4); combined length of  $p^4$ – $m^2$  3·1 (3·4).

*Hab.* Ankafina Forest, Eastern Betsileo.

*Type.* Adult female, skinned out of spirit. B.M. no. 82.3.1.17. Collected February, 1881, by the Rev. W. Deans Cowan. Thirty-seven specimens originally examined,

of which, however, the majority were not retained for the Museum.

When I originally described *Microgale longicaudata* \*, two of the specimens measured, one of them the type, stood out from the rest by their larger size and longer tails, but they were not thought to be specifically different until Dr. Forsyth Major, a few years ago, drew my attention to the possibility of two species being mixed up in the series. After the extraction of further skulls I find this suggestion to be correct, and now name the new species in honour of its first observer. The skull-measurements, however, given in the original description of *longicaudata* are those of a *majori*, and I therefore now publish for the first time those of the real *longicaudata*, taken from the type, no. 82. 3. 1. 15. The latter species is evidently much the rarer of the two, as only two specimens of it were collected by Mr. Cowan as against thirty-seven of *majori*. An additional example of *longicaudata* was obtained by Dr. Major at Amboanara in 1896.

It may be of interest to record that these two long-tailed species of *Microgale* have the end of the tail for from half an inch to an inch naked and transversely wrinkled on its upper surface, just as in certain prehensile-tailed Muridæ. This character, and also the more lengthened fifth hind toe of the same species, indicates that these forms are arboreal, being the only Insectivora—other than the Tupaiidæ—which are so. Nor is any other truly prehensile tail known in the order.

### 3. LEPTOGALE, g. n.

Genotype. *L. gracilis* (*Oryzorhates gracilis*, Maj.).

A remarkably slender-skulled form, with quite a number of special characteristics. The peculiar long narrow muzzle and small subequal widely spaced teeth, and the suppression in the molars of the prominent internal lobe so marked in other forms, render this one of the most isolated members of the group.

Dr. Major's brief preliminary account of it indicates that he appreciated its nearer relationship to *Microgale* than to *Oryzorhates*, and his use of the latter name was only due to his then thinking it possible that the two genera would grade into one another, and he therefore used the earlier

\* J. Linn. Soc., Zool. xvi. p. 319 (1882).



name. But that he later realized its peculiarity is proved by his having written on the typical skin a special generic name, no doubt intended for ultimate publication.

4. NESORYCTES, g. n.

Genotype. *N. tetradactylus* (*Oryzoryctes tetradactylus*, M.-Edw. & Grand.).

No other species known, as *O. niger*, Maj., appears to me to be merely a melanism of *N. tetradactylus*.

Very like *Oryzoryctes* in most respects, but not quite so highly modified for a fossorial life and with only four fore-claws. Its fur is like that of other members of the group, and not modified into the velvety condition of that of the Talpidæ, as is the case in *Oryzoryctes*. The skull also is less markedly ridged and broadened behind than in that genus, nor is it so expanded at the tip of the muzzle.

No special differential characters in the teeth.

It may be here recorded that both *Microgale cowani* and *Nesoryctes tetradactylus* possess a baculum in the penis. The presence of this bone has been recorded in the larger Tenrecidæ, but no other Insectivores possess it.

The bone in *Nesoryctes* is a simple slightly curved spicule 6 mm. in length, thickened at the proximal end.

5. ORYZORICTES, M.-Edw.

*Oryzoryctes*, Trouess. (emend.).

Genotype and only species. *O. hova*, M.-Edw.

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XXXV.—*The Baculum or Os Penis of some Genera of Mustelidæ.* By R. I. POCKOCK, F.R.S.

MR. OLDFIELD THOMAS'S paper upon the *os penis*—or the *baculum*, as he appropriately names it—of the Sciuridæ shows that this bone, at least in the case of those rodents, has a quite unexpected value, greater than that supplied by the skulls and teeth, in determining the affinities of the genera. Very possibly it has a similar systematic importance in other groups of Mammalia, and deserves, in consequence, more attention than has hitherto been given to it by osteologists.

As has long been known, this bone is especially well developed in the Arctoid and Cynoid Carnivora. It has been

described in a great many genera of Canidæ, Ursidæ, Procyonidæ, and Mustelidæ; and in the case of the Mustelidæ it was made the subject of a special paper by Pohl (Jena. Zeitschr. xlv. pp. 381-394, 1909), who figured and described the bone in the following genera and species:—*Galera barbara*, *Lutra lutra*, *Gulo luscus*, *Meles meles*, *Zorilla zorilla*, *Martes foina*, *Martes martes*, *Mustela erminea*, *Mustela nivalis*, and *Putorius putorius*.\*

During the past few years I have collected the *bacula* of a considerable number of Mustelidæ that have died in the Gardens of the Zoological Society, and have verified the observations published by Pohl and others on the following species:—*Lutra lutra* †, *Meles meles*, *Galera barbara*, *Zorilla striata*, *Martes foina* and *M. martes*, *Mustela erminea* and *M. nivalis*, *Putorius putorius*, and *Gulo gulo*. To these I am now able to add *Grison furax* and *Charronia flavigula*, of which the *bacula* have not been previously described apparently, and I have taken the opportunity of figuring and describing it in *Mellivora*, because it was very indifferently described and left unfigured by Gilbert.

Attention may again be drawn to the singular differences between the *bacula* of *Mustela erminea* and *M. nivalis*. By the shape of the bone the latter falls into the same category as *Mustela* (*Putorius*) *putorius* and *furo*. In *M. africana* the bone is shaped substantially as in *M. nivalis*.

I may add that the tip of the glans penis in the Mustelidæ is composed of highly vascular erectile tissue, which, when distended with blood, fills the concavity of the bone formed by the upcurvature of its distal end.

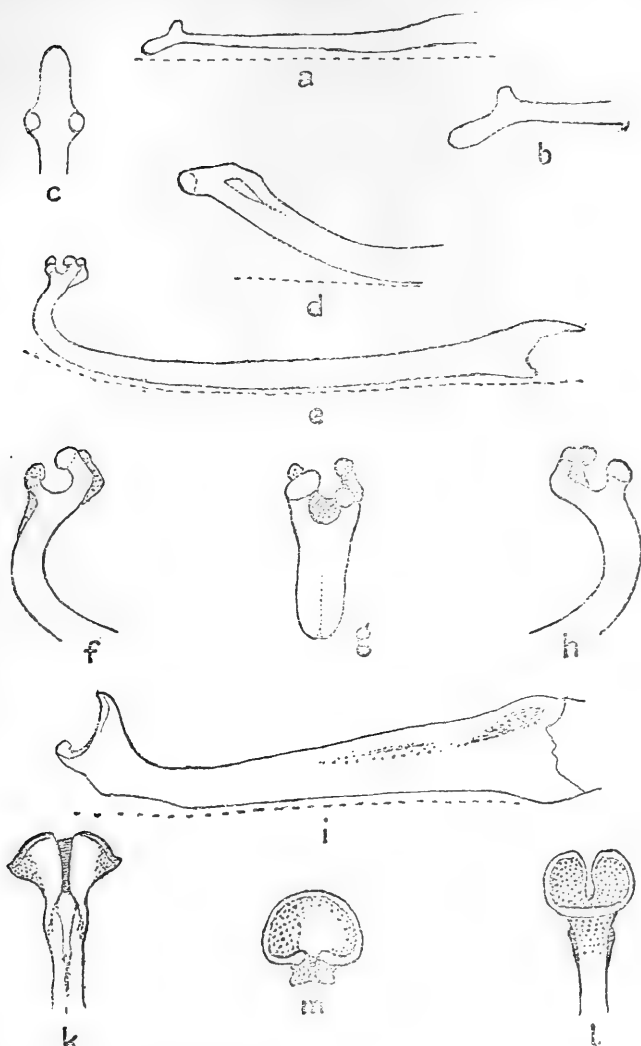
### Genus CHARRONIA, Gray.

*Martes*, section *c*, *Charronia*, Gray, Cat. Carn. Brit. Mus. 1869, p. 86; type, *flavigula*, Bennett.

The characters embodied by Gray in his definition of *Charronia* were of little or no systematic value. Down to the present time therefore the large Oriental marten (*M. flavigula*) has been invariably assigned to the genus *Martes*. It appears to me, however, that the structure of the *baculum*,

\* Pohl, it should be explained, referred *foina* and *martes* to the genus *Mustela* and *erminea* and *nivalis* to the genus *Ictis*. I have here altered his terminology to bring the names into accord with recent usage. Since the memoir contains references to previously published works upon the subject in hand, I have not troubled to cite them in this paper.

† Lönnberg has figured and described the *baculum* of the sea-otter *Letax lutris* (Anat. Anz. xxxviii. p. 231, 1911).



- a. Baculum of *Grison furax* from the left side, nat. size.
- b. Extremity of the same,  $\times 2$ .
- c. Extremity of the same from above,  $\times 2$ .
- d. Extremity of baculum of *Martes foina* from the left side,  $\times 2$ .
- e. Baculum of *Charronia flavigula* from the left side, nat. size.
- f. Extremity of the same,  $\times 2$ .
- g. The same from the front,  $\times 2$ .
- h. The same from the right side,  $\times 2$ .
- i. Baculum of *Mellivora* from the left side, nat. size.
- j. Extremity of the same from below, nat. size.
- k. The same from above, nat. size.
- l. The same from the front.
- m. The same from the front.

In a, d, e, and i the dotted line shows the course of the urethra along the ventral side of the baculum.

which differs greatly from that of *Martes martes* and *M. foina*, justifies completely the future adoption of *Charronia* in full generic sense.

The genus may be diagnosed as follows:—Baculum long, slender, nearly straight, and nearly evenly attenuated for the greater part of its length, its terminal sixth being slightly expanded and strongly upcurled. Its basal third a little compressed above, flat below, and marked by a shallow wide groove. The portion of the baculum between this point and the upcurled end is subcylindrical and has no inferior groove. The terminal portion is bent abruptly upwards and slightly backwards with a concavo-convex curvature, the proximal half of this portion being somewhat depressed and widely grooved above and very indistinctly and narrowly grooved below. The apex is a little expanded and is furnished with four subsymmetrically arranged, short, blunt processes arranged quadrilaterally, the two posterior being geniculate, longer, and set higher up than the anterior, all ending in slightly expanded and rounded tips. The anterior process of the right side is the thickest of the four, and the posterior of the right side is set a little further back than the posterior of the left side.

The baculum examined, extracted from an old example of *Charronia flavigula peninsularis*, gives the following measurements:—Total length 78 mm., length following the inferior curvature of the upturned end 85 mm., basal width 4 mm., width at narrowest part 3 mm., width of tip 4 mm. The great length of this baculum may be judged by comparing it with that of the adult *Mellivora* recorded below and with that of an example of *Galera barbara* with a basal skull-measurement of 103 mm., that of the *C. flavigula* being 86 mm. In the *Galera* the baculum is only 61 mm. Again, in a specimen of *Martes foina* with a basal skull-measurement of 72 mm., the baculum is 55 mm. It thus more nearly approaches the baculum of *C. flavigula* in relative dimensions than in *Galera*.

The baculum of *Charronia flavigula* differs from that of *Martes foina* and *M. martes* in the following respects:—In the two species of *Martes* the distal third of the bone is bent upwards with a gradual and open curvature, the tip is not expanded and ends in two branches—a lower, which is nearly straight, and an upper, which rises on the right side of the base of the lower and curves obliquely forwards towards the left to coalesce with the distal end of the lower in adult examples of *M. foina*, but remaining permanently distinct

from it at all ages in *M. martes*, as established by Pohl and others.

#### Genus GRISON, Gray.

In an example of *Grison furax* from Cordova, in Argentina, the baculum is slender and moderately long, with a sinuous curvature in its thicker basal third, the rest of the main shaft being straight and attenuated, and approximately the terminal sixth a little expanded and depressed. The posterior third is compressed and carinate above, flat but not grooved below. From the posterior third up to the depressed termination the slender shaft is cylindrical and marked below by a narrow linear groove. The terminal piece is parallel-sided and apically rounded. It is depressed at an angle of about  $140^{\circ}$ , and just at the bend on the upper side there rises a pair of erect horn-like apically rounded excrescences. Total length 44 mm.; length of depressed termination 6 mm., width across the horns 3 mm., of narrowest part just behind the horns 2 mm.

This baculum differs from that of all the Mustelidæ in which the bone has been described in having the end depressed and provided with two short upstanding processes on the dorsal side a little behind the apex. At first sight it recalls the baculum of the Procyonid *Bassariscus* described by Lönnberg (Anat. Anz. xxxviii. p. 232, 1911), but in that genus the two processes arise from the underside of the bone.

#### Genus MELLIVORA, Storr.

The baculum of this genus was very briefly described by Gilbert, and the description was repeated by Pohl, to whom the bone itself was quite unknown. It may be interesting and useful, therefore, to publish a figure and a new description of it.

Baculum deep and wide at its root, attenuated and tolerably straight for five-sixths of its length, the terminal sixth being upturned and expanded. The upper edge of the basal half somewhat compressed and subcarinate. The lower surface widely grooved longitudinally. The wide apex not recurved, but directed forwards and upwards and expanded into a cup-shaped hollow much wider from side to side than from above downwards. The thin upper and lateral rims of the cup form a continuous nearly semicircular curve, but the lower rim is transverse and interrupted in the middle line by a narrow deep cleft which at the bottom passes into the groove

traversing the lower surface of the baculum. The edge of the cup on each side of this cleft forms a lobate thickening.

The measurements of the baculum examined, which was extracted from a specimen of *Mellivora ratel*, are as follows:—Total length in a straight line 70 mm.; length along the inferior curve 77 mm.; width at the base 11 mm., at the narrowest point behind the upcurved end 4 mm.; of the expanded cup-like termination 12 mm., height of the latter 9 mm.

It may be added that in *Mellivora*, as in other genera and species of Mustelines with the tip of the baculum upcurved, the urethral canal does not follow the curvature, but runs straight forwards, following the line of the lower surface of the baculum.

### XXXVI.—*New Heterocera in the Joicéy Collection.*

By LOUIS B. PROUT, F.E.S.

#### Family Zygaenidæ.

##### Subfamily CHALCOSIINÆ.

#### 1. *Eterusia proprimarginata*, sp. n.

♂.—48 mm.

Head and body above black, beneath pale buff; collar red, as in *pulchella*, Koll. Abdomen above with very fine, in part interrupted, buff rings at the extremities of the segments.

Wings shaped as in *pulchella*. *Fore wing* brownish black, the yellow markings consisting of a longitudinal streak behind cell from base, as in *pulchella*, the transverse median band more interrupted at M than in that species; a large spot at the discocellulars, and a row of submarginal spots between SC<sup>5</sup> and M<sup>1</sup>, recalling the anterior part of the series which is developed in *elizabetha*, Walk. *Hind wing* predominantly yellow, blackened in proximal part of cell, on veins M (as far as the origin of M<sup>1</sup>), M<sup>2</sup>, and SM<sup>1</sup>, in the abdominal region to the same extent as in *elizabetha*, and irregularly at the distal margin, the border being rather narrow (about 2 mm.) between apex and M<sup>1</sup>, then forming a triangular proximal projection; a roundish black spot between R<sup>3</sup> and M<sup>1</sup>, nearly touching the distal border.

Fore wing beneath with the yellow markings a little broadened, the subapical ones paler. Hind wing beneath with the black parts only feebly expressed (olive-grey), but with two strong roundish black outer spots, one corresponding to that of upperside, the second between  $M^1$  and  $M^2$ .

Chiang Yang, Central China, July 1888 (*A. E. Pratt*). Type in Coll. Joicey; 2 ♂♂ in coll. Brit. Mus. Also a ♂ from Ichang and one from Ta-tsien-lu in coll. Brit. Mus.

Unaccountably mixed by Leech among *elizabetha*; collar red, wings narrower, fore wing wanting the yellow longitudinal line in cell and the large submarginal spot behind  $M^2$ ; hind wing wanting the black transverse mark near end of cell and with narrower, quite differently shaped distal border. Evidently nearer to *pulchella*, but larger, both wings differently marked in distal half.

### Family Geometridæ.

#### Subfamily *HEMITHEINÆ*.

#### 2. *Synclysmus nigrocristatus*, sp. n.

♂.—31 mm.

Face whitish, irrorated with light brown and darker red-brown, a small pointed tuft at the lower extremity tipped with the latter colour. Palpus black on upper and outer sides and at tip. Vertex white mixed with brown. Thorax dirty white, much mixed with brown and red-brown above, and in part with black. Abdomen more ochreous, with rather strong brown black-mixed crests; a red tinge on sides.

*Fore wing* white, shaded with light brown (less strongly in submedian and terminal areas than in the rest of the wing); lines formed of black irroration more condensed at anterior end; first extremely oblique from costa at base; antemedian from costa at 3.5 mm. to middle of hind margin, sinuous, excurved in cell, incurved between fold and  $SM^2$ ; postmedian at about two-thirds, dentate, rather deeply inbent between the radials and again between  $M^1$  and fold; a more reddish-brown shade between this and the very indistinct, dentate, whitish subterminal; termen with elongate black markings between the veins.

*Hind wing* long (*Pingasa*-shaped), whiter than fore wing, *Ann. & Mag. N. Hist.* Ser. 9. Vol. i.

with postmedian line indicated posteriorly, marked with a small dark spot at abdominal margin and slight indications of small admarginal spots between the veins; terminal markings as on fore wing. Fore wing beneath white, in anterior part (except towards distal margin) with some coarse dark irroration, at costal margin mixed with reddish; a slight blackish patch at base of costa, a stronger one at origin of postmedian line, which otherwise is scarcely developed; terminal markings weaker than above. Hind wing beneath with weak terminal markings.

Diego-Suarez, Madagascar.

### 3. *Heterorachis melanophragma*, sp. n.

♂.—22 mm.

Face blackish brown. Palpus beneath pale. Vertex white. Antenna pale ochreous, in places with a tinge of reddish; pectinations long. Thorax above green; abdomen above reddish sprinkled with black, the anterior segments each with a white spot, the posterior ones with a white belt. Underside of body and legs pale; fore leg somewhat marked with red; hind tibia somewhat dilated.

*Fore wing* with SC<sup>1</sup> anastomosing slightly with C, R<sup>1</sup> connate, M<sup>1</sup> connate; pale French-green or dull malachite-green, more opaque than *diaphana*, Warr.; costal edge narrowly ochreous; a small black cell-dot; a slender interrupted brown terminal line, strongly sprinkled with black scales; fringe chequered, blackish opposite the veins, white between.

*Hind wing* with termen more ventricose than in *diaphana*; C anastomosing very slightly with SC, continuing appressed for a short distance, SC<sup>2</sup> short-stalked, M<sup>1</sup> short-stalked; as fore wing. Underside whitish green, unmarked; costal edge of fore wing rather more broadly ochreous than above, but somewhat paler.

Diego-Suarez, Madagascar.

### Subfamily STERRHINÆ.

#### 4. *Anisodes (Pisoraca) concinnipicta*, sp. n.

♂.—41-42 mm.

Face and palpus dull reddish above, whitish buff below; palpus long (nearly three times diameter of eye), second joint



with the erect hairs of upperside strongly developed, third joint nearly as long as second. Vertex and antennal shaft pale, with only very minute and very sparse pink irroration. Thorax and abdomen concolorous with wings; tegula with a geranium-pink transverse bar near extremity; abdomen with pink dorsal dots on first two or three segments; hind tibia with the single proximal spur well developed.

*Fore wing* moderately elongate, termen almost smooth; cream-buff with fine pink irroration; a minute pink whitish-pupilled annulus on DC; antemedian pink dots placed as in *fastidiosa*, Dogn. (Ann. Soc. Ent. Belg. xlv. p. 441), but on an average more elongate, especially that on the cell-fold; a faint zigzag grey median shade placed nearly as in *fastidiosa* or still more oblique posteriorly; postmedian pink dots nearly parallel with median shade, connected by faint traces of a fine line; submarginal pale line very feebly indicated by faint shades proximally and distally; terminal dots small, but sharp.

*Hind wing* with termen subcrenulate, with an appreciably stronger tooth at  $R^3$ ;  $M^1$  widely separate from  $R^3$ ; markings corresponding to those of fore wing. Underside less irrorated; markings nearly as in *fastidiosa*, median shade of fore wing rather broad, proximal subterminal shade of fore wing and median shade of hind wing rather well developed.

Sierra del Libane, Colombia, 6000 ft. (H. H. Smith),  
2 ♂♂.

May be placed next to *punctulosa*, Warr. (Nov. Zool. xi. p. 31).

#### Subfamily GEOMETRINÆ.

##### 5. *Mimaletis paucialbata*, sp. n.

♂.—40–43 mm.

Head and body with the colouring of the rest of the group (*postica*, Walk., &c.), the three areas of the face (black down the centre, white down the sides) sharply defined, the white dorsal markings of abdomen not very broad.

*Fore wing* narrower than in the allies; the orange ground-colour less reddish; costal edge very narrowly black to base; a very small black basal mark, throwing out a slight prong along M; black apical border broad anteriorly, its margin commencing at middle of costa and running fairly straight to hind margin close to tornus, slightly crenulate;

the contained white spots small, the anterior one not reaching  $SC^5$  or  $R^3$ , the second very small and the third a minute dot; posterior margin slightly folded and narrowly blackish.

*Hind wing* slightly narrower than in the allies; the black cell-spot large; border not broad, the white spots small or very small, anteriorly obsolescent. Underside similar, but with the white spots of hind wing slightly better developed.

Lake Bangweolo, N. Rhodesia, Sept. 1917 (*T. A. Barns*), 2 ♂♂.

Superficially nearest to *reducta*, Prout (Nov. Zool. xxii. p. 369), but with the white spots still further reduced; very distinct in shape, robuster build, coloration, large cell-spot of hind wing, &c.

#### 6. *Craspedosis niveosignata latesignata*, subsp. n.

♂.—Distinguished from name-typical *niveosignata*, Warr. (Nov. Zool. vi. p. 47, Ron Island), by having the white patches broader (on fore wing at  $R^3$  4 mm., on hind wing from proximal edge to distal edge at  $R^3$  8 mm.), sometimes in addition blurred white scaling behind middle of cell of fore wing. Abdomen with the black belts dorsally interrupted or obsolete.

Mysol, foot-hills, 100–500 ft., Oct.–Nov. 1916, wet season (*W. J. C. Frost*), 3 ♂♂.

### Family Hypsidæ.

#### 7. *Aganais diastrophæ*, sp. n.

♂.—55 mm.

Head orange; palpus with a black spot at end of first and of second joint, third joint wholly black; antenna black. Thorax and abdomen orange, paler beneath; abdomen with black spots dorsally and laterally.

*Fore wing* with termen curved, extremely oblique, hind margin slightly excavated close to tornus, then protuberant, the sex-patch strongly developed; fawn-colour, proximally mixed with orange, without sharp demarcation; the cell-spot of underside showing through. Underside orange, rather paler than above, the apical region of fore wing (from costa just before cell-spot to tornus) and the sex-patch and a few apical scales of hind wing fawn-colour with

a smoky admixture; fore wing with a large black cell-spot, hind wing with a black dot.

Maevatanana, Tananarivo district, Madagascar, 2 ♂ ♂.

It is not altogether impossible that this may be the ♂ of *concolora*, Swinh. (Ann. & Mag. Nat. Hist. (7) xi. p. 503), described from the ♀ only, but it seems very improbable, as that has broad wings, the second joint of palpus more extended black above, the tarsi and spurs black, &c.

8. *Nyctemera pellex frosti*, subsp. n.

♂.—40–43 mm.

*Fore wing* with the white spots reduced in size; *the elongate white hind-marginal streak reduced to a small spot* (1 or 2 mm. in length) at 5 or 6 mm. from base.

*Hind wing* with black border strongly broadened (as in some aberrations of *pellex separata*, from the Northern Moluccas); *abdominal margin broadly grey-black*, this shade extending at least to the fold, and proximally encroaching so as even to enter the cell; the black at costal margin shaped as in *pellex separata*.

Kei Islands, Dec. 1916–Feb. 1917 (W. J. C. Frost), type ♂ and another.

9. *Nyctemera luctuosum rostrigera*, subsp. n.

♀.—*Forewing* with the white subbasal patch behind the cell enlarged, reaching posteriorly to  $SM^2$ , thus only separated, in its distal part, from the hind-marginal white streak by a line along  $SM^2$ ; postdiscal white band in general somewhat narrowed; *a beak-shaped white projection outward from this band between  $R^2$  and  $R^3$* , as in *galbanum*, Swinh.; fringe sometimes whitened towards tornus. *Hind wing* with the white in the fringes more or less extended.

Philippines: Cebu (J. J. Mounsey), type ♀ and another; Mindanao (*ex* Semper), two ♀ ♀.

This is certainly the *luctuosum* of Semper (compare Schmett. Philippinen. p. 492, pl. lviii. fig. 1), but I am by no means certain that it is not a distinct species or possibly a dimorph of *galbanum*, Swinh., wanting the characteristic white spot in cell of fore wing; compare the remarks of Semper (*l. c.*) under that species, though *galbanum* is certainly not the Luzon representative of *luctuosum* (*rostrigera*), for the Joicey collection possesses three typical *galbanum* from Cebu.

## Family Liparidæ.

10. *Otroeda varunæa tenuimargo*, subsp. n.

♂. *Fore wing* with the black border much reduced, at its widest part 8 mm., behind  $R^2$  scarcely over 1 mm. in width, vanishing in a point before  $M^2$ ; the contained white spots also reduced, well separated, the one between  $R^2$  and  $R^3$  placed entirely on the ground-colour, in an angle which is formed by the apical and discal border.

*Hind wing* with the border rather narrow.

Abercorn, N. Rhodesia, June 1917 (*T. A. Barns*).

The first eastern representative known to me of this group. Some entomologists to whom I have shown it have thought it a good species, chiefly on account of the *angle* in the black border of the fore wing; but as I have seen some rather intermediate aberrations from the Lualaba River, Congo, I feel satisfied it is merely a local race. The black streaks from costa are not extremely attenuated; the proximal ends on  $M^2$  about 5 mm. from its origin, the distal in a fine point just behind  $M^1$ , but both will probably prove more or less variable in development.

XXXVII.—*Note on Laccoptera vigintisex-notata, Boheman.*  
By S. MAULIK, B.A. Cantab., F.E.S., F.Z.S.

THE object of this note is to clear up the confusion among the different varieties of *Laccoptera* mentioned below. Hitherto they have been considered different species, perhaps owing to insufficient material. This note is based on the material contained in the collection of the British Museum, as well as on that of the Indian Museum and other sources from India. The figures show the form of the insect, but they are mainly intended to show the disposition and situation of the black spots on the prothorax and the elytra. The surface-structure of the insect is not represented in the drawings.

*Laccoptera vigintisex-notata*, Boheman.

*Laccoptera* 26-notata, Boh. Mon. Cassid. iii. 1855, p. 66.

Var. *Laccoptera novemdecimnotata*, Boh. Mon. Cassid. iii. 1855, p. 67.

Var. *Laccoptera hospita*, Boh. Mon. Cassid. iii. 1855, p. 68.

Var. *Laccoptera multinotata*, Boh. Mon. Cassid. iii. 1855, p. 70.

Body subtriangular. Colour brown, with black spots on the prothorax and the elytra. These spots are variable in number, but their disposition in relation to each other is

Fig. 1.

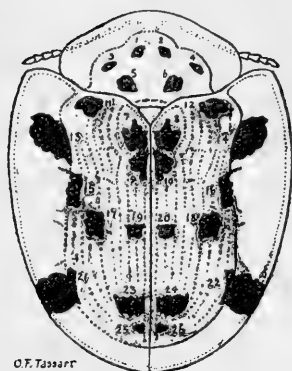


Fig. 2.

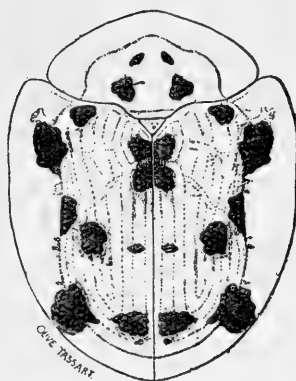


Fig. 3.

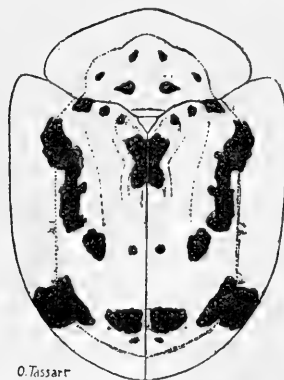


Fig. 1.—*Lacoptera 26-notata*,  $\times 7$ .

Fig. 2.—*Lacoptera 19-notata*,  $\times 7$ .

Fig. 3.—*Lacoptera hospita*,  $\times 7$ .

constant. By the absence of some of them or fusion with each other the number is increased or diminished. The

greatest number is twenty-six. The variation is explained in fig. 1.

Length  $10\frac{1}{2}$ –10, greatest breadth 9–8 mm.

*Head*: dorsally completely concealed by the explanate margin of the prothorax. Viewed from the ventral side the clypeus is elevated. The antennæ are long and slender; the first joint is long and stout, the second is very small, the third is about one-and-a-half times longer than the fourth; the latter and the fifth and sixth each become smaller than the preceding one; the apical five joints are thicker and more hairy than basal six joints.

*Prothorax*: narrower than the elytra at base, more or less elliptical in shape; the basal margin is sinuate on either side. The upper surface is uneven, smooth, impunctate, and without wrinkles. It has six round black spots which are variable.

*Scutellum*: triangular, with the apex acute. The surface is smooth and impunctate.

*Elytra*: broader at base than the prothorax. Behind the scutellum there is a low hump. The surface is punctate-striate. The punctures are more or less square pits. The interstices are raised into costæ. There are also raised short transverse costæ joining the interstices. In many places, particularly below the hump, many punctures have run into each other, forming rather large depressions.

*Underside*: the claw-joint slightly projects beyond its preceding joint. The combs on either side of the claws in all the varieties are developed, that on the inner side consists of three long and one short teeth, that on the outer side consists of two long and one short teeth.

The pattern of black patches and spots, their variation and other differences between *Lacc. 26-notata*, *L. 19-notata*, *L. hospita*, and *L. multinotata* are shown in the accompanying table (p. 321).

There are two specimens in the collection of the British Museum, in one of which spots nos. 1–6 are absent, 11 and 12 are also absent, 13, 15, 17, 21, 23, and 25 have fused into a long broad band, the corresponding spots on the other elytron have also done the same, the underside is without any black markings except the two lower spots on the explanate margins of the elytra showing through. In the other specimen (N. Chin Hills, Burma) the elytral spots are almost obsolescent, 7, 8, 9, 10 are not fused, 13, 15, 21, and 25 are entirely absent, the corresponding spots on the other elytron are also absent; the whole of the underside is black. I consider these specimens as varieties of *L. 26-notata* as well.

<i>L. 26-notata.</i>	<i>L. 19-notata.</i>	<i>L. hospita.</i>	<i>L. multinotata.</i>
1. No. of spots.	1. No. of spots.	1. No. of spots.	1. No. of spots.
On prothorax ..... 6	On prothorax ..... 4	On prothorax ..... 6	On prothorax ..... 6
On hump ..... 4	(3 & 4 have disappeared ; see figs. 1 & 2).	On hump ..... 1	On hump ..... 1
(in many cases they fuse into one).	On hump ..... 1	On each elytron .. 6+6=12 (13, 15, & 14; 16 have fused into a long patch on each side; 19 & 20 in most cases are obsolescent; if 13, 15, & 14, 16 are considered separate and 19 & 20 are counted, the total becomes 23; figs. 1 & 3).	On each elytron.. 6+6=12 (15 & 16 have disappeared; 25 & 26 have also disappeared).
On each elytron .. 8+8=16 (these spots are variable, in that some disappear).	On each elytron .. 7+7=14 (in most cases 25 & 26 have disappeared; figs. 1 & 2).	—	—
26	19	19	19
2. Underside black except the sides; sometimes only the thoracic sternæ are black.	2. The metasterna are black; the rest is brown.	2. The underside has no black patches at all.	2. The underside has no black patches at all.
3. Usually the apical five joints of the antennæ are black or sometimes no joint is black.	3. No joint black, sometimes two joints black.	3. Three or four or five joints black.	3. No joint black, sometimes four or five joints black.
4. Usually four spots on the explanate margins of the elytra show through on the underside, sometimes only the lower two show through.	4. Four spots show through.	4. The lower two spots only show through.	4. Four spots show through.

From the above facts it can be deduced that (1) there is no structural difference between these species of Boheman, (2) the variation is confined to colour and size (*multinotata* is generally of smaller size), (3) disposition of the spots and patches in relation to each other is constant, (4) the difference in their total number is caused by the absence or fusion of two or more spots into one. These considerations point to the conclusion that the differences on which Boheman created several species may fall within individual variation. I therefore consider 19-*notata*, *hospita*, and *multinotata* varieties of 26-*notata*. I have selected 26-*notata* as the name of the species because its description precedes those of the others in his monograph and because it is more convenient to state the maximum number first and then call others the varieties according as the number is reduced.

The insect has a wide distribution in Indo-China, Burma, the Malay Archipelago, and the adjacent islands. It seems that a variety tends to confine itself to one locality. As a rule 19-*notata*, *hospita*, and *multinotata* are not found within our faunistic limits, although 19-*notata* has been known to occur in Assam, Burma, and a form of *hospita* with reduced markings has been taken at Maymoyo, Burma (v. 1910, H. L. Andrewes). L. 26-*notata* has been reported from Burma, Pegu, Upper Tenasserim, N.E. Assam, Sibsigar, Shillong (S. E. Peal), and Cachar. It has also been found in Tonkin. The types of these are probably in the Stockholm Museum.

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XXXVIII.—*Two new Indian Cassidinæ Beetles.*

By S. MAULIK, B.A. Cantab., F.E.S., F.Z.S.

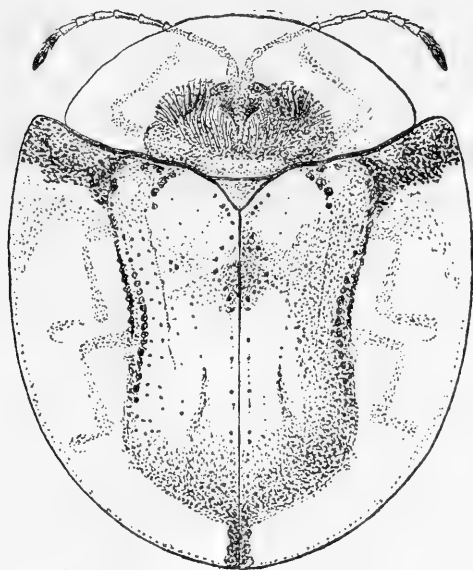
THE following descriptions are of two new insects from India. One belongs to the Indian Museum and the other to Mr. H. E. Andrewes. *Aspidomorpha chandrika*, sp. n., has a great superficial resemblance to *Chirida cruciata*, Linn. The latter is a South-American species, and the former is found in the Eastern Himalayas.

*Aspidomorpha chandrika*, sp. n.

Body rotundate. The colour of the disc of the prothorax,



the elytra, the anterior lateral angles of the explanate margin of the elytra, and the suture at the apex, *i. e.*, on the explanate margin, is yellow-brown, which is not uniform, some portions being lighter than others. The species has a darker variety in which the colour is deeper brown. The explanate margins are light yellowish and transparent, with a honey-comb structure. The fact that the suture is marked at its apex distinguishes this from all other Indian species. Hence the name *chandrika*, which is a Sanskrit word meaning "a mark" or "beauty spot."



*Aspidomorpha chandrika*, Maulik,  $\times 10$ .

Length 7-8, greatest breadth 6-7 mm.

*Head*: it is completely concealed under the explanate margin of the prothorax. Owing to the transparency of the former the dorsal surface is indistinctly visible from above. Viewed from the underside the clypeus is slightly elevated, smooth, and impunctate. The basal six joints of the antennæ are slender and less hairy; the apical five joints are thicker, more hairy, and the last two joints are black. The first joint is long and club-shaped, the second is small, the third is the

longest, the fourth, fifth, and sixth become shorter and shorter.

*Prothorax*: semi-elliptical, broader than long, narrower than the base of the elytra. The basal margin is almost straight except for a slight sinuation near the scutellum. The explanate margin is broad and gently reflexed, so that the upper surface is concave. The central region or the disc is convex, smooth, and impunctate. Owing to a peculiar transparency of the chitin, elongate bunches of fibrous structure are visible.

*Scutellum*: triangular, surface impunctate.

*Elytra*: broader at the base than the prothorax. Posterior to the scutellum there is a conical pointed hump. The humerus is raised and convex. The surface is plain and has scattered rows of punctures. Nearer the suture the rows are far apart from each other, each row consists of groups of punctures of twos or threes in a longitudinal line separated by considerable distances. The punctures are slightly coarser and the rows are closer near the margin.

*Underside*: the same colour as above, but more shining. The claws have the usual comb-like structure both on the inner and outer side.

Described from sixteen examples.

Eastern Himalayas: Darjeeling district, alt. 1000–5000 ft., May, June, and July, 1912 (*Lord Carmichael*); Pashok, 26. v.–14. vi. 1916 (*F. H. Gravely*).

*Aspidomorpha spaethi*, sp. n.

Body rotundate. The colour is dirty brown with a greenish tinge, shining. On the underside of the explanate margins at the four corners, viz., the anterior and posterior lateral angles, there are deep red-brown patches which show through on the upperside. Posterior to the scutellum there is a conical pointed hump.

Length 9–10, greatest breadth 8–9 mm.

*Head*: it is entirely concealed under the explanate margin of the prothorax. The clypeus is rather short, so that the mouth-parts are more approximated to the base of the antennæ. The basal six joints of the antennæ are elongate, the apical five are thicker, more hairy, and having more greenish tinge, the last two joints are black. The first joint is long and club-shaped, the second short, the third elongate, longer than fourth and many times longer than the second; the fourth, fifth, and the sixth become shorter and shorter.

*Prothorax*: semielliptical in shape, the basal margin is gently bisinuate. The upper surface of the prothorax without the explanate margins is unevenly convex, smooth, impunctate. The peculiar transparency of the chitin is visible. The explanate margin is broad, transparent, and shows the usual honeycomb structure.

*Scutellum*: triangular, with the surface smooth and impunctate.

*Elytra*: broader at the base than the prothorax. Posterior to the scutellum there is a pointed conical hump. The humerus is smooth, shining, and impunctate. The surface is scatteredly punctate-striate, the punctures are a little coarser at the basal surface and near the suture. The arrangement of the punctures and the rows are similar to that of the other species which is usual in the genus. The explanate margins are transparent and show honeycomb structure. At the four corners, as indicated in the above diagnosis, where the marks on the under surface show through, the surface of the explanate margins is slightly raised.

*Underside*: dirty brown, shining, smooth. The legs are sparsely covered with hair. In the dried specimens before me the tarsi are decidedly green in colour.

Described from six examples in Mr. H. E. Andrewe's collection. These specimens bear Spaeth's manuscript name *Asp. acuta*. I can trace no published description of the insect. I have therefore decided to publish a description of it.

South India: Nilgiri Hills (*H. L. Andrewes*).

Type in Mr. H. E. Andrewe's collection.

---

XXXIX.—On a new Genus and Two new Species of Amatidæ (Syntomidæ) in the Joicey Collection. By W. J. KAYE, F.E.S.

#### Genus CRINOPHORA, nov.

♂. Proboscis well developed. Palpi downcurved. Antennæ with short bristles. Tibiæ with short spurs. Fore wing beneath with vein 1 close to inner margin, nearly straight; vein 2 from before end of the cell commencing downcurved, then with a large dip, finally finishing upcurved;

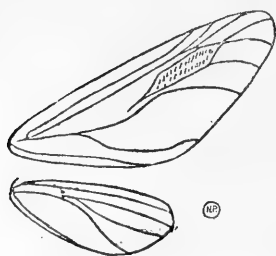
3 absent, 4 and 5 parallel from outer margin of an oblong scent-patch lying beyond the cell; 6 and 8 from upper corner of scent-patch, 7 absent, 9 absent, 10 from angle of cell, 11 from before angle. Fore wing above with 5 and 6 carried through to the cell. Hind wing with 2 from lower angle of cell, 3 and 4 from a point close to angle, 5 absent, 6 and 7 coincident.

♀. With vein 1 bent up to a point near middle; vein 2 long before end of cell, evenly curved downwards to outer margin; 3 from lower angle of cell, 4 and 5 stalked; a slight fold between 5 and 6; vein 6 from top of middle discocellular, 7 absent, 8, 10, 11 stalked. Hind wing as in ♂. The ♀ has thus an extra vein, vein 3 being present which is absent in the ♂.

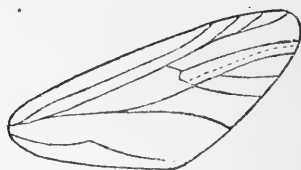
Type, *C. bicellulata*.

*Crinophora bicellulata*, sp. n.

♂. Fore wing brownish black with transparent areas. Basal half of wing hyaline except for a broad belt of dark scaling along median vein. Apical half of wing brownish black, with small hyaline patches between veins 4, 5 and 5, 6. A band on the underside shows through and appears



♂ underside.



♀ underside.

*Crinophora bicellulata*.

as a dead black elongated patch nearly parallel with costa. Hind wing hyaline, with a broad apical area of brownish-black scales and a smaller trapezoidal area at tornus.

♀. Fore wing with large hyaline patch within the cell, a smaller patch below the cell from base, and a much larger patch extending to tornus. An oblong patch above vein 6

and transparent patches between veins 3, 4 and 4, 5. Hind wing as in ♂.

♂ ♀. Head black, frons white, tegulæ orange. Abdomen with seven yellow belts. Antennæ blackish from the tip to half its length, whitish beneath.

*Hab.* Philippines, Cebu (*J. J. Mounsey*).

3 ♂ ♂, 2 ♀ ♀.

Type in Coll. Joicey.

*Crinophora palawanica*, sp. n.

♂. Fore wing very narrow and pointed. Coloured similarly to *Crinophora bicellulata* except that the hyaline spaces are yellowish, the patch on inner margin small and less than half the size of the same patch in *bicellulata*. Hind wing very small and very pointed. The central transparent area very restricted. Apex and inner margin broadly brownish black. Collar, tegulæ, and metathorax orange. Frons black. Antennæ with the tips pale yellowish.

*Hab.* Philippines, Palawan (*Doherty*).

4 ♂ ♂.

Type in Coll. Joicey.

## BIBLIOGRAPHICAL NOTICE.

*Shells as Evidences of the Migrations of Early Culture.* By J. WILFRED JACKSON. Manchester: University Press. London: Longmans, Green, & Co.

NOWADAYS our analyses of the geographical distribution of animals and plants is based upon the assumption that this distribution is indicative of the wanderings of such organisms from some common centre, governed by "barriers" such as temperature, mountain-ranges, forests, deserts, or large areas of water; or they may be determined entirely by the matter of food-supply. But the ethnologist, in his endeavours to trace the birthplace and spread of ancient customs and beliefs, commonly ignores this method of argument. He sees in them no evidence of genetic relationship, but attributes their existence to the "similarity of the working of the human mind." Each of such customs or beliefs are for him, in short, a special creation. Rather than abandon this archaic mode of reasoning he will swallow whole caravans of camels.

Prof. Elliot Smith has long been striving to induce the protagonists of this antiquated school to adopt more enlightened methods of reasoning. By way of demonstrating the effectiveness of the more rational method one of his disciples—Mr. Wilfred Jackson—has set himself the task of tracing the migrations of early culture by means of the molluscan shells which came to be intimately associated therewith.

This shell-cult began, apparently, far back in prehistoric times, in the neighbourhood of the Red Sea and the eastern Mediterranean, where cowries, shell-purple, shell-trumpets, pearls, and pearl-shell came to be regarded as possessions of great price. In these, indeed, the foundations of religion, art, and commerce were laid, and with this cult went the erection of megalithic monuments and sun-worship.

The cowry shell appears to have been the seed out of which the associated complex of ideas developed. It was regarded with peculiar veneration, at least semi-erotic in its origin, for it would seem that the belief in its life-giving powers, which dominated all its other ascribed virtues, arose out of the suggested likeness of the inferior aspect of the shell to the human vulva. It imparted fertility and help in parturition. Endowed thus with mystical gifts of vitality, it became the custom to bury cowries with the dead, to ensure their resurrection. The wonderful powers of cowry shells having thus possessed men's minds, it is not surprising to find them used as artificial eyes for mummies and idols, as charms against the "Evil-eye" and to bring good luck. Hence their use in games of chance and as currency, where, originally, as "pearls of great price," they were given in exchange for some much desired object which these alone could buy.

The great antiquity of these beliefs is attested by their discovery with the remains of Cro-Magnon man and in prehistoric graves in Great Britain, as well as among the ancient Chinese, while to-day they retain all their ancient potency among savage peoples the world over.

The Author has convincingly presented the evidence he has so laboriously collected that there seems no room for doubt as to his contention that this shell-cult was spread by early adventurers in their search for gold and pearls, and the metals, which necessarily carried them further and further afield. Wherever they settled there they set up their megalithic monuments inseparably associated with sun-worship. Thus we have a consistent story, and thus we can trace the wanderings of early man from the Old World to the New. This thesis, at any rate, is far more reasonable than the contention that these apparently precisely similar beliefs associated with the same objects were independently evolved "by the similarity of the working of the human mind."

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# CONTENTS OF NUMBER 4.—*Ninth Series.*

	Page
XXX. Descriptions of New <i>Pyralidæ</i> of the Subfamily <i>Pyraustince</i> . By Sir GEORGE F. HAMPSON, Bart., F.Z.S., &c. ....	265
XXXI. A peculiar State of Development in <i>Brachydesmus</i> (Myriapoda—Polydesmoidea). By HENRY W. BRÜLEMANN (of Pau, Basses-Pyrénées, France) .....	281
XXXII. Notes on Fossorial Hymenoptera.—XXXIII. On new Ethiopian Species of <i>Psammocharidæ</i> . By ROWLAND E. TURNER, F.Z.S., F.E.S. ....	284
XXXIII. The Homologies of the Anal Plate in <i>Antedon</i> . By F. A. BATHER, D.Sc., F.R.S. ....	294
XXXIV. On the Arrangement of the small <i>Tenrecidæ</i> hitherto referred to <i>Oryzorictes</i> and <i>Microgale</i> . By OLDFIELD THOMAS .....	302
XXXV. The Baculum or Os Penis of some Genera of <i>Mustelidæ</i> . By R. I. Pocock, F.R.S. ....	307
XXXVI. New Heterocera in the Joicey Collection. By LOUIS B. PROUT, F.E.S. ....	312
XXXVII. Note on <i>Lacoptera vigintisex-notata</i> , Boheman. By S. MAULIK, B.A. Cantab., F.E.S., F.Z.S. ....	318
XXXVIII. Two new Indian <i>Cassidinæ</i> Beetles. By S. MAULIK, B.A. Cantab., F.E.S., F.Z.S. ....	322
XXXIX. On a new Genus and Two new Species of <i>Amatidæ</i> ( <i>Syntomidæ</i> ) in the Joicey Collection. By W. J. KAYE, F.E.S. ....	325

## BIBLIOGRAPHICAL NOTICE.

Shells as Evidences of the Migrations of Early Culture. By J. WILFRED JACKSON .....	327
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XL.—*Notes on Exotic Chloropidæ*.—Part II. Oscininæ.  
By C. G. LAMB, M.A., B.Sc., Clare College, Cambridge.

*OSCININÆ*.

This section of the family, like the Chloropinæ, is very indeterminate in generic relationships, and there are even more cross-relationships than occur there. It will be noted in what follows that increased spatial extension of several genera is established, and further evidence of the remarkably wide distribution of dipterous genera, even though apparently of highly specialized types, is thus brought to light. It is a point of considerable interest that this semi-cosmopolitanism is possessed by the families and genera of Diptera to a far greater extent than it is by the other chief insect groups, though it unfortunately diminishes greatly their usefulness in regard to questions of distribution.

The genus *Oscinis*, Mcq., still remains to be adequately dealt with, as has been observed previously by Becker, in spite of having shed various more or less well-marked sections. This task cannot well be undertaken without a very extensive collection of world-wide range, as the great majority of the species are too briefly described, with the omission of many minor characters of great systematic value, and are in general unfigured. The colour-characters, so often

dwelt on to the exclusion of structural details, appear to vary within considerable limits in this subfamily, and hence much of the published descriptive work is of comparatively little help in deciding to which section of the genus a species should be allotted.

As before, all the types have been deposited in the British Museum.

The author is indebted to Dr. F. J. H. Jenkinson, of Trinity College, Cambridge, for forming the generic names. The references to the genera are all omitted, as they will be found in Becker's monographs, referred to in the former paper [Ann. & Mag. Nat. Hist. (S) vol. xix. p. 33 (1917)].

#### APROMETOPIS, Becker.

*A. flavofacies*, Beck.

NATAL: Durban (*F. Muir*, Camb. Coll.).

#### *Aprometopis minima*, sp. n.

This is a remarkably small species, and can be described briefly but adequately as follows:—

In form and structure almost exactly a small replica of *flavofacies*; the head is, however, a little less prominent and the face less concave. The whole insect, including legs and wings, is pale yellow, the anterior of frons and the antennæ more orange; the ocellar spot is black, but absolutely no other dark spots or marks are to be seen.

In two specimens the head has fallen in as a result of drying, which gives a fallacious appearance to the frons.

Size just under 2 mm.

S. INDIA: Coimbatore (*T. B. Fletcher*).

Note appended:—"From larva in rotten cholam-stems, and in cholam stubble."

#### SCOLIOPHTHALMUS, Becker.

*S. obliquus*, Beck.

First described as *Anacamptoneurum obliquum*, Beck., from Egypt. The present specimen is practically identical with his description.

S. INDIA: Coimbatore.

*S. trapezoides*, Beck.

One specimen, which agrees well with the description and figure, except that the jowls are just perceptibly deeper and the hairs less white.

NATAL: Durban (*F. Muir*, Camb. Coll.).

*Scoliophthalmus micans*, sp. n.

This is a small shining species from S. India belonging to the *trapezoides* section, which must be close to *S. albipennis*, although quite distinct.

Head (top view):—Frons on sides black with a brownish tone; triangle extending right over frons, the base about  $\frac{2}{3}$  of the cross vertical breadth, the tip slightly rounded, sides straight; it is all very shining, with the usual border of pale hairs; under side illumination it is seen to have three broad rounded parallel ridges, the first extending from ocellus, and a shorter one on each side. Face shining black; antennæ darkish orange, with a fine basal arista. Side view (fig. 1): jowls deepening to back, all deep shining black, with stoutish vibrissæ; palp entirely inside mouth, small and black.

Fig. 1.



Fig. 2.

*Scoliophthalmus micans*,  $\times 30$ .

Thorax: dorsum very shining black, with sparse minute punctures and fairly long brown hair, especially so behind; scutellum as dorsum, but the punctures nearer and larger, in shape a roundly truncate triangle, with long divergent end-bristles on small papillæ; pleura shining black.

Wings (fig. 2) clear, with palish veins, the absolute costa somewhat darkened distally up to the break. Halteres with black shining knobs.

Legs predominantly dullish orange, but the coxa, femur, and tibia are somewhat extensively suffused (though not truly black) except at the base and tip of tibia; the last tarsal joints of hind legs are also dark.

Abdomen all shining black, with fairly long pale hairs, especially at the sides and on the male hypopygium.

Size just under 2 mm.

S. INDIA: Coimbatore.

The next series of species belongs to some of the allied Meroscinid genera, such as *Meroscenis*, *Dactylothyrea*, &c. These form a fairly natural group, but show extreme variety of structural detail; nevertheless, they are readily recognizable. The variety of scutellar structure is quite remarkable, ranging from the simple form of *M. tibiella* up to the extraordinary shapes found in *Dactylothyrea* and *Epicelyphus*. The complex intermingling of various characters makes the limitation of genera even more difficult than usual, and in consequence some genera have within their present boundary quite heterogeneous assemblages. The group will doubtless be found to include a great number of species, as they are often small and easily overlooked. When a proper amount of material is obtained, it may be possible to arrive at a more satisfactory generic allocation; at present it is desirable, as far as possible, to avoid increasing the number of genera.

In such a study it will be necessary to pay much attention to the punctuation of the thoracic dorsum and the scutellum. The former is generally smoother than the latter, which is often rugose or shagreened in various ways, and the punctuation of the two differs in amount and form. The thoracic punctures differ in size and "pitch" or distance apart, and in some cases are very remarkable. Thus, in the new genus *Lonchonotus* it will be found that most of the punctures consist of a complex of three tiny ones, forming an isosceles triangle of long base. In *Dactylothyrea* similar punctures occur, but to a less extent, and they are also visible in *M. validissima*. The description of these characters is a matter of much difficulty, as is their delineation, owing to the shininess of the general surface; but it will be necessary to pay much attention to the above points. In any case the relative degrees of punctuation of dorsum and scutellum can be noted if absolute values are not attainable.

## MEROSCINIS, de Meijere\*.

*M. plumigera*, Loew.

NATAL: Durban (*F. Muir*, Camb. Coll.) ; S. RHODESIA : Salisbury (*G. A. K. Marshall*).

*M. æneifrons*, Lamb.

NATAL: Durban (*F. Muir*, Camb. Coll.) : S. RHODESIA : Salisbury and Chirinda Forest (*G. A. K. Marshall*).

*M. rugosa*, Lamb.

NATAL: Durban (*F. Muir*, Camb. Coll.).

Specimens are present which cannot be separated in the slightest degree from the last two species, which were first described by the author from the Seychelles (Trans. Linn. Soc. xv. 1912, part 3, pp. 332, 333). They both belong to the *scutellata* section of the genus, with a large steely-blue triangle ; the species *æneifrons* is very close to *scutellata*, if one may judge from the description of the latter. The true *scutellata* has a bright red third joint to the antennæ, and *æneifrons* has normally a black one, but in some cases it is distinctly rufous centrally. It might be supposed that one is dealing with a variable species with many local forms ; however, the exact identity of the African and Seychelles specimens is not only a matter of interest in itself, but inclines one to the opinion that these closely related forms are true species.

Two single-specimen species from Ceylon are very distinct from any described in Becker, III.

*Meroscinis foveata*, sp. n.

The insect is remarkably punctate, the dorsal and scutellar punctures being very similar in depth and distribution, which is not a usual character. The long scutellum has a terminal pair of long bristles and two smaller ones on each side, all on well-marked tubercles. The chaetotaxy is unusually strong.

Head (top-front view, fig. 3):—All black, the eye-margins

\* There are some who find pleasure in the barren and (to others) annoying pastime of diligently working at disturbing well-known and long-established names. If such an one reads this paper, he may possibly find something to excite his curiosity in the Kansas Univ. Sc. Bull. iii. no. 6, p. 197.

dull, the triangle very shining black, its base occupying about  $\frac{2}{3}$  of the vertex and its tip extending to the antennæ and rounded. Side-view: antenna bright orange except for the slightly infuseate tip of the 3rd joint; arista pubescent, much paler than usual; all the bristles on head strong; the palpi are retracted, but are apparently black; vibrissa evident.

Thorax (fig. 4): dorsum all shining black, coarsely and shallowly punctate, the hairs well developed, brownish; scutellum as above; pleura all smooth, shining black.

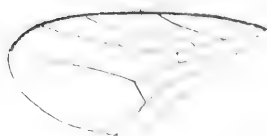
Fig. 3.



Fig. 4.



Fig. 5.

*Meroscinis foveata*,  $\times 22$ .

Wings (fig. 5) with basal widening of 1st posterior cell less than usual, clear, with brown veins. Halteres with black head and yellow stalk.

Legs stouter and hairier than usual; all black, except for the entirely pale yellow tarsi.

Abdomen shining black, haired as the thorax.

Length a little over 2 mm.

CEYLON: Peradeniya (*A. Rutherford*).

*Note*.—This species must be related to *M. albiseta*, Beck. (III. p. 193), but is abundantly distinct.



*Meroscinis planiscutellata*, sp. n.

The second species is more normal in punctuation and general form, but has the scutellar disc flattened like in *Chloropisca*.

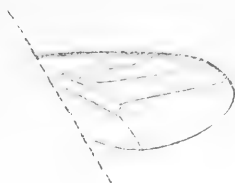
Head (top-front view, fig. 6):—Black, eye-margins dull, triangle shining, its base extending nearly across vertex, sides straight, tip extending to antennæ and slightly rounded; antenna with brown basal joints, clear orange 3rd, and dark pubescent arista. Side-view: all bristles prominent, including the vibrissa; jowls narrowly linear, shining black, as is the hind head.

Thorax (fig. 7): dorsum all shining black, the hairs

Fig. 6.

Fig. 7.

Fig. 8.

*Meroscinis planiscutellata*,  $\times 22$ .

standing in tiny punctures and showing brown against the background; scutellum subtrapezoidal, flattened on the disc and covered there with coarse shallow shagreening; long terminal bristles on small tubercles, a smaller one on each side on a smaller tubercle, and a few bordering hairs.

Wings (fig. 8) clear, with yellow veins, 4th ending before tip, 1st posterior cell but little widened at base. Halteres dull orange.

Legs all alike; coxa black, trochanter just visibly orange, femur black except the knee, tibia with broad infuscato belt leaving base and tip orange, tarsi all orange.

Abdomen shining black.

Size 2 mm.

CEYLON: Peradeniya (A. Rutherford).

*Meroscinis validissima*, sp. n.

This species is aberrant in respect to its powerful hairy legs and its abdomen, which has the peculiarity shared by

several Chloropids (*e. g.*, some *Elachiptera*) of possessing a very large 2nd segment, longer than the rest of the abdomen. The legs are exceptionally well developed, long, stout, hairy, and even subspinose antero-inferiorly on the femur. The head-bristles are very long and strong, the thoracic ones not markedly so. The general head and body form is very like the ordinary type, though more robust in every way, and the colour-scheme is that of the *scutellata* group. It is represented by two males only, and although these show a very evident hypopygial appendage (smaller than, but approaching to, that of *Dactylothyrea*), it is thought best to assign them to the present genus, although they are probably worthy of at least subgeneric rank.

Fig. 9.

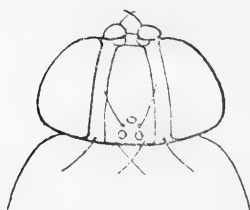
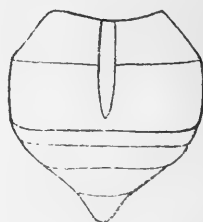


Fig. 10.

*Meroscinis validissima*,  $\times 22$ .

Head (top-front view, fig. 9):—Eye-margin dull black, getting very slightly broader anteriorly and leaving free the large steely-blue trapezoidal triangle, which extends right up to the antennæ and has very long inwardly bent bordering hair-rows; the usual f.o. hair-rows are also very strong, the verticals, long crossed post-verticals, and very divergent ocellars are all long, the last-named inserted close together on the middle of the ocellar area. Side-view: antennæ normal, with black basal joints and dark brown 3rd, a long black very pubescent (almost hairy) arista; upper lip just visibly protuberant but sharply so, vibrissæ present, palpi black. Face all black, as is the hind head.

Thorax black, rather dull, profusely and minutely punctate, with longish fine hairs, which show up brown against the black; scutellum more coarsely, though likewise shallowly, punctate, triangular in plan, with rounded end and also well arched in side-profile; four tubercles, the end two with long

black bristles, the others with short ones ; pleura all shining black.

Wings perfectly typical, with widened 1st posterior cell, glassy, with brown veins. Halteres with black head and orange stalk.

Legs very robust, long, front coxa noticeably so, all clothed with strong dense hairs except beneath the femur, where the hairs become almost bristles, as mentioned above, especially on the front pair ; in colour entirely pitchy black, except the tarsi, which are whitish yellow, with the terminal joints blackened ; the tarsi all densely haired.

Abdomen (fig. 10) all shining black, with palish hairs, except for a large triangular area on the 2nd segment, which is quite bare. The whole abdomen is flattened, pointed, oval in profile ; the second segment is as long as all the others together, and the basal segments have a deep central axial sulcus. In side-view one can see a well-developed, though small, free hypopygium, which is shining black and hairy, except for a side protuberance, which is orange.

Size  $3\frac{1}{4}$  mm.

NATAL : Durban (*F. Muir*, Camb. Coll.).

This species seems to be an early step towards *Dactylothyrea*.

#### DACTYLOTHYREA, de Meijere.

##### *D. hyalipennis*, de Meijere.

There are several specimens, both ♂ and ♀, which agree with the description of this Javanese species ; it is not quite certain that they are the same, as no numerical relation between the relative lengths of "fingers" and thorax is given by de Meijere. In the present specimens there is a very small additional finger basal to the two main ones, carrying a small spine. There appears to be no valid reason for separating them as a distinct species.

CEYLON : Peradeniya (*J. C. F. Fryer*, Camb. Coll.).

#### LONCHONOTUS, gen. nov.

There is a series of a handsome Meroscinid from Durban which offers some difficulty. It appears to be another "linking" species. The general facies is that of a large *Meroscinius*, approximating to *validissima*, but with quite ordinarily shaped and clothed legs ; the wings are veined like those of *Dactylothyrea*, having almost parallel veins and no widening at the springing of 4th ; the scutellum is long, with

four tubercles of considerable length, compared with any true *Meroscinis*, though falling far short of those in *Dactylothyrea*, and these tubercles bear long brilliant orange spines like those of *Thyridula*. The most remarkable character is possessed by the male, which has large and complex hypopygial segments resembling closely those of many Dolichopids. This hypopygium has side-flaps carrying end-valves, between which lies a long penis, while the previous segment carries complex chitinous processes.

Although the author is one of those who objects to multiplying genera, there appears in this case to be no escape from the process.

In addition to the above remarks, the following can be added:—Like *Meroscinis* in general form of head and thorax, the latter punctate, as is the elongate scutellum; legs very long, the front coxa especially so; the thorax with normal bristles and well developed.

*Type*, the following species.

*Lonchonotus formosus*, sp. n.

Head (top-front view, fig. 11):—All black, the triangle very shining, not quite extending across vertex, the tip extending right up to the antennæ; head-bristles all long but slender, normal as for *Meroscinis*, but the hair-rows bordering the triangle are especially long. Antennæ quite normal, all dull orange, the 2nd joint narrowly bordered with black on its margin, 3rd with a dusky tip; arista slender, black, finely pubescent. Side-view: vibrissa present, palpi stoutish, black.

Thorax (fig. 12) bluish black, fairly coarsely punctate, covered with black-brown hairs; last d.-c. and pleural bristles long but slender. Scutellum rounded in vertical section, triangular in profile; hairs and punctures as on dorsum, with four long tubercles each carrying a long brilliant orange bristle.

Wings (fig. 14) yellow, with yellow veins. Halteres yellow.

Legs quite long, the front coxa being especially so, variegated with shining black and orange; all coxæ black, trochanters yellow, femora and tibiæ shining black except at knees and extreme tip of tibiæ; front tarsi orange on 1st joint, others black, mid and hind tarsi black on last joint, others orange.

Abdomen shining black, but darkish orange on the basal

segments, rather soft in texture, but not so much so as in *Dactylothyrea*; the male with a Dolichopid-like hypopygium (fig. 13) as described above.

Size  $3\frac{1}{4}$  mm.

NATAL: Durban (*F. Muir*, Camb. Coll.).

Fig. 12.



Fig. 11.



Fig. 13.

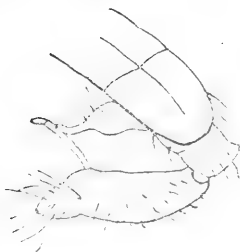


Fig. 14.



Figs. 11, 12.—*Lonchonotus formosus*,  $\times 22$ .

Fig. 13.—*Lonchonotus formosus*,  $\times 40$ .

Fig. 14.—*Lonchonotus formosus*,  $\times 22$ .

#### HETEROSCINIS, gen. nov.

The two species now to be dealt with offer considerable difficulty. They have many points of resemblance, but differ in others which might well be considered of generic

importance in the present subfamily. One species is represented by a specimen in first-rate condition, the other by a very good specimen and a headless one. At present it seems best to adopt a makeshift and place them in the same genus, although it is highly probable that further research will discover other forms allied to both the species, which should then be placed in separate genera. The generic description has therefore been drawn so that if the words in brackets are deleted the characters will hold for the first species (*variegata*) and any future congeners; the other species (*ornata*) can then be relegated to a new genus.

*Generic diagnosis*.—The whole insect, including frons, glabrous; forehead and mouth-margin about equally prominent, with a concave profile between; the tangent-plane to these and that to the frons meet at a little more than a right angle. Antennæ, 3rd joint suborbicular, rather like that of *Siphonella*, with a faintly pubescent arista. Eyes absolutely bare, long-oval, oblique. Head-bristles fairly normal, small inner verticals, large outer, parallel post-verticals on the ridge, small ocellars many (or a few), fine f. o. hairs. The triangle ill-differentiated except by colour (or scarcely at all) from the frons. Single vibrissa. Tongue fleshy, not long, with a distinctly bent tip. Thorax with the d.-c. lines marked by a row of bristle-bearing punctures, rest of dorsum with fairly regular bristle-rows of different "pitch" from that of the d.-c. punctation (or perfectly smooth). The scutellum is remarkable; it is triangular in outline, long, with long divergent end-bristles and a following row of four or five smaller stout stubby ones on the lower edge, all of them standing on more or less well-marked papillæ as in *Meroscinitis*; dorsum swollen in profile (or flattened on the disc). Wings clear, with venation as shown in fig. 16. Legs normal.

The above will show that the general affinities of both species tend towards some forms of *Siphonella*, but the exceptional scutellar development and other details render the position of the genus very doubtful.

*Type*, the following species with above reservation.

*Heteroscinitis variegata*, sp. n.

Head (top view):—Frons excessively shining orange, with sparse and exceedingly fine hairs; triangle leaf-shaped, shining brown, the base about half the vertical cross-width, the tip about  $\frac{2}{3}$  the distance from ocellus to frons. The face is orange, antenna with 2nd joint orange, the suborbicular

3rd has the tip somewhat blackened, especially inside; arista orange, pubescent when seen under ( $\times 60$ ). Side-view as fig. 15, all orange, including palpi; hind head shiny black, with longish horizontal orange spot behind ocelli.

Fig. 15.

*Heterosciniis variegata*,  $\times 30$ .

Thorax: dorsum very shining black, with tiny punctures from which the hairs arise; the main rows along the d.-c. lines are about twice as closely set as are the other more irregular rows; these number five between the d.-c. rows and two or three rather irregular rows beyond; callus and notopleura shining orange; scutellum triangular, about half as long as the thoracic dorsum, sharply cut off from it, rounded in side-profile, dark orange-black, with shallow irregular larger punctures; the long end-bristles on very conspicuous tubercles, the short thorn-like side ones on slightly smaller ones, all black; pleura shining black except anteriorly, where it is orange.

Wings clear, with very pale yellow veins, much like fig. 16, except that 2, 3, and 4 are all a little longer and are advanced at the end a little more round the costa.

Legs strong, shining orange, except that the hind femora are widely ringed nearly to the knees, mid femora less so, front femora but slightly; all the tibiæ black, the last two tarsal joints suffused.

Abdomen; basal segments orange, the others black, all shining and slightly haired.

Size  $2\frac{3}{4}$  mm.

S. RHODESIA: Chirinda Forest (G. A. K. Marshall, Camb. Coll.).

The insect has a curious superficial resemblance to a large shining *Merosciniis*.

*Heteroscinis ornata*, sp. n.

This second species is a considerably smaller bright orange insect, which has a remarkably different general aspect from the last and some structural differences of importance.

Head (top view):—Frons and triangle all smooth pale shining yellow, the demarcation between the sides and triangle being difficult to see, but with a suitable illumination the border-row of extremely fine hairs can just be seen; they define a large triangle with its base across the vertex and slightly rounded tip right up to the front, it being just perceptibly more shining than the rest; the absolute ocellar area is black. Face all pale yellow, as is the antenna, the 2nd joint narrowly bordered with brown, and the small suborbicular 3rd with a tiny black spot at arisal insertion; the arista is brownish and like that of the last species in structure. Side-view: very like fig. 15, but the head proportionately a little longer axially; a distinct black bristle on hind jowl; in colour all pale yellow, with orange exerted palp; hind head all yellow.

Fig. 16.

*Heteroscinis ornata*,  $\times 22$ .

Thorax superficially very different from that of last species, the dorsum being all excessively smooth and brilliantly shining; the d.-c. lines are occupied by a row of tiny close-set pits carrying very minute black hairs; in colour it is slightly orange, callus bright yellow, on the dorsal side of the same a tiny black spot; scutellum half as long as thorax, triangular in profile, with slightly rounded sides and sharp point, deeply cut off from thorax, the disc a little duller, pale yellow, and quite flat; the border of the flat part is edged with brown lines from the tip (these themselves being bordered with a few hairs inside), and these run across the thoracic dorsum in two slightly concave lines nearly to the middle; the long black end-bristles stand on quite small papillæ; the sides are also plane and carry the side-spines on still smaller



papillæ, which are inserted mainly on the lower edge. Pleura shining yellow, metanotum shining orange.

Wings (fig. 16) absolutely clear, with palest yellow veins. Halteres pale yellow.

Legs all yellow except the claws.

Abdomen somewhat oval, orange, with the following black spots on each side:—a small one at lower angle of 3rd segment, a large triangular one based on distal edge of 4th and occupying one-third the breadth and the whole of the side of that segment, a smaller similar one on 5th which does not extend so far up side of segment.

Size about 2 mm.

S. RHODESIA: Salisbury (*G. A. K. Marshall*, Camb. Coll.).

### SIPHONELLA, Meq.

#### *Siphonella robusta*, sp. n.

There is a fair series of a large strongly built insect of this genus, which (like *S. palposa*) has strong palpi and a shortish fleshy tongue.

Head (top view):—Eyes bare, frons shining chestnut-brown, orange in front, the triangle shining black, with the usual hair-borders, the base about half the cross vertical breadth, the point about centre of frons. Face yellow; antenna yellow, with orbicular 3rd joint and an almost bare arista; a very narrow but well-developed ridge separates the foveæ; palpi protuberant, rod-like, bright orange. Side-view: jowl deep, about  $1\frac{1}{2}$  times 3rd joint, all orange; it is divided into two areas by a ridge from the back of the eye to the front mouth-margin, the lower area being somewhat bent in sideways to the side mouth-margin; face somewhat hollow, the frons and mouth being equally prominent, tongue dark orange, moderately long, fleshy; small vibrissa. Hind head all black.

Thorax all very shining, with tiny well-defined punctures; in a good light some of these form two just perceptibly more regular double rows along the d.-c. lines, the other punctures being profusely scattered over the rest of the dorsum in quite irregular lines; hairs black, as are the calli and all the bristles. Scutellum subtriangular, with slightly convex sides and rather sharp point, the disc somewhat flattened, shagreened with larger shallow punctures, bristled like *S. ruficornis*, with two closely set, nearly parallel, strong terminal

bristles and a row of some eight or ten shorter ones on each side along the lower edge. Pleura shining black.

Wings pale, with yellow veins, costal section 2 to 3 a little greater than 3 to 4, which is about  $\frac{2}{3}$  of 2 to 1; small cross-vein opposite end of 1; hind cross-vein sloping so that if produced it would cut costa at end of 2; distance between cross-veins a little more than length of hind one, which is nearly twice its length from the abbreviated end of 5. Halteres orange.

Legs all orange, generally with broad dark rings on the hind femur and tibia; sometimes the rings are faint or even absent, sometimes they are on the other legs as well, but less extensive.

Abdomen shining black, a somewhat flattened oval, with the last segment somewhat triangular and about twice as long as the preceding one; hairs fine, blackish brown, fewer on the last segment.

Size  $2\frac{3}{4}$  mm.

S. RHODESIA: Salisbury (*G. A. K. Marshall*, Camb. Coll.).

#### SIPHUNCULINA, Rond.

##### *S. funicola*, Meij.

There is a long series of this insect in both collections from Singapore, Coimbatore, and Ceylon. The specimens show some variation in size. The antennæ are not always clear red, being occasionally a little infusate apically. The thoracic hairs are said to be black, and against a light background this is true, but when viewed against the black dorsum it can be seen that the hairs are brownish and the darkness of the brown itself varies.

A note appended to some specimens says "on decaying cholam shoots." This is the well-known and troublesome "eye fly."

##### *S. ornatifrons*, Loew.

Several specimens are present which must be assigned to this species. On the whole, they agree well with Becker's description (I. p. 132), but the distal part of the wing is not like his figure (I. pl. iii. p. 52), the wing being longer and the costa between 2 and 3 not so arched. If one supposes that the figure was made from a wing which was bent on its distal half so as to be out of the normal plane, the discrepancy is accounted for. Errors of this sort can be traced in several

of Becker's figures. The frontal colouring varies a little; when a specimen is in first-rate condition the grey eye-margins and the three spots on them are very distinct, the triangle is narrowly bordered with grey, and there are a few tiny parallel grey lines running from this to the front. A slight degree of damage seems to remove the pollen easily, and then one can only just glimpse the dark spots, the borders becoming faint. In two worn specimens it is practically impossible to see the frontal pattern. The length of the triangle also varies a little, depending on the amount of shrinkage of the orange lunule. In all main characters the agreement is good.

S. RHODESIA: Salisbury (G. A. K. Marshall, Camb. Coll.).

*Siphunculina intonsa*, sp. n.

Two rather indifferent specimens occur of a species which does not agree with any hitherto described. The general colour is entirely black, but the head and thorax are provided with peculiar hairs in regular rows on the thorax; these are bright silky yellow, short and stout, like stubble.

Head (top view):—Frons slightly shining and very minutely roughened, covered with the above-described hairs; triangle duller and also roughened, with its base about  $\frac{2}{3}$  of

Fig. 17.



*Siphunculina intonsa*,  $\times 30$ .

the vertical breadth, straight sides, and the point halfway from vertex to antennæ; ocelli somewhat widely separated; no spots or marks on the head. In front the antennæ are deeply sunk in pits and approximate at the base, 3rd joint orange with darkened tip, and a fine, bare, very short arista. The palpi are hidden in the gum used to secure the specimens, but appear to be orange; tongue rather long. Side-view: all shining black, very similar to Becker (I. pl. iii. p. 53).

Thorax shining black, very finely roughened, with regular rows of the above-mentioned hairs. Scutellum rounded, dull, more roughened than thoracic dorsum, with four short pale terminal bristles. Pleura shining black, the notopleural bristles pale.

Wings (fig. 17) pale, with whitish veins. Halteres shining black.

Legs: all coxæ black, trochanters orange, femora black except knees, tibiæ orange with broad black rings, smallest on the front pair; tarsi orange.

Abdomen all shining black.

Size  $1\frac{3}{4}$  mm.

CEYLON: Peradeniya (*A. Rutherford*).

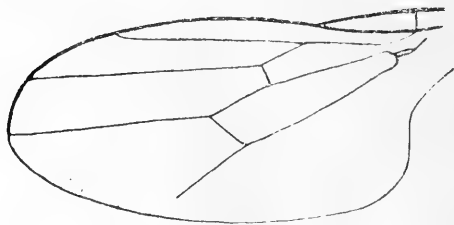
### EPIMADIZA, Beck.

There are two new species of this interesting little form, one represented by several specimens, one by a single very perfect specimen.

#### *Epimadiza nigra*, sp. n.

Head (top view):—All very shining, slightly bluish black, the triangle only demarcated by its border-lines of very faint hairs; the triangle extends about half across the vertex basally and its point is about midway to the frons; the bristles

Fig. 18.



*Epimadiza nigra*,  $\times 30$ .

are outer verticals, widely separate p.v., tiny ocellar, a few just visible f.o. The face is orange; antennæ darkish orange, just separated at the base by a tiny ridge, inserted in pits, arista hair-like and orange; palpi orange. Side-view:

jowls dark orange-black, divided into two parts by a line from the lowest point of eye to the insertion of the small vibrissa, the upper part of this area being duller than the lower, which is quite shining; the depth is about twice that of the 3rd joint.

Thoracic dorsum and scutellum rather shining, all densely but finely shagreened and practically bare, small notopleurals, and parallel scutellars; pleura all shining black, callus prominent.

Wings (fig. 18) glassy and pale-veined. Halteres black.

The legs vary somewhat in colour, being very chitinous, especially the femora; the "black" in what follows is sometimes nearly darkish orange; coxa black, trochanter dark orange; femur blackened, front pair much swollen, hind pair less so, the former with the usual pair of small spines; tibia black, tarsus orange.

Abdomen all shining black, tinted with orange on the base.

Length  $2\frac{1}{2}$  mm.

S. RHODESIA: Salisbury (G. A. K. Marshall, Camb. Coll.).

*Var.* (?).—There is a single specimen which could well be considered as another species if more individuals were present. It is very like the above, but differs as follows:—Frons orange in front, antenna bright orange, upper half of jowls bright dull orange; last cross-vein more oblique instead of nearly straight across, and longer, so that it is only about  $1\frac{1}{2}$  times as far to the end of 5 as is its own length.

Size just over 3 mm.

Locality the same.

*Epimadiza nitida*, sp. n.

The single well-preserved specimen is fairly near *E. rugosa*, Beck., but it is a very distinct and brilliant little insect.

Head (top view):—All excessively shining; triangle as in last species, but even less well defined by the hair-rows; face orange, with two small black spots just over the mouth-margin; antennæ as in *E. nigra*, orange, but a little suffused on the 3rd joint apically. Side-view: lower anterior eye-margin dark orange, merging into the shining black jowls, which are nearly parallel to the lower eye-margin and are about the depth of 3rd joint. Palpi bright orange, tongue black.

Thorax as in last species, but much more shining, the pleural and the two scutellar bristles long, the scutellum with side-rows of four or five smaller ones; pleura very shining black.

Wings clear, with pale veins (fig. 19). Halteres bright orange.

Fig. 19.

*Epimadiza nitida*,  $\times 30$ .

Legs: front pair—the long coxa and the trochanter bright orange, femur (except at base), tibia, and tarsus (except last two yellow joints) all shining black: mid and hind pairs—coxa black, trochanter dark orange, femur black (except the tip), the rest yellow,

Abdomen all shining black.

Size  $2\frac{1}{2}$  mm.

NATAL: Durban (*F. Muir*, Camb. Coll.).

#### ANATRICHUS, Loew.

##### *A. erinaceus*, Loew.

Specimens of the form with darkened front tarsi and of that with bright legs are in the Camb. Coll. from Durban (*F. Muir*).

Var. *pygmæa*.—There is a remarkable form from Ceylon which is practically identical with the darker variety of the type, but is only about  $\frac{3}{4}$  of its length.

CEYLON: Peradeniya (*J. C. F. Fryer*, Camb. Coll.).

[To be continued.]

XLI.—Notes on Fossorial Hymenoptera.—XXXIV. On Ethiopian Psammocharidæ in the British Museum. By ROWLAND E. TURNER, F.Z.S., F.E.S.

Family Psammocharidæ.

*Cyphononyx optimus*, Sm.

- Pompilus optimus*, Sm. Cat. Hym. B.M. iii. p. 141 (1855). ♀.  
*Salix* (*Cyphononyx*) *lynx*, R. Lucas, Deutsch. Ost-Africa, iv., Hymen. p. 65 (1897). ♂.  
*Cyphononyx abyssinica*, Grib. Ann. Mus. Civ. Genova, xiv. p. 343 (1879). ♀ ♂.  
*Salix* (*Cyphononyx*) *schönlandi*, Cam. Rec. Albany Mus. i. p. 223 (1905). ♂.

*Cyphononyx bretonii*, Guér.

This wide-ranging species is referred to by R. Lucas as *Salix* (*Cyphononyx*) *croceicornis*, Duf. *C. bretonii* is a composite species, but I think the name should be retained for the male. The female is a *Batozonus*, which I regard as a form of *B. fuliginosus*, Klug. But if the name is rejected or held to apply to the female, then the present species should be known as *Cyphononyx croceicornis*, Erichs., which has priority over Dufour's name.

*Cyphononyx atropos*, Sm.

- Mygimnia atropos*, Sm. Cat. Hym. B.M. iii. p. 186 (1855). ♀.  
*Salix* (*Cyphononyx*) *splendens*, R. Lucas, Deutsch. Ost-Afrika, iv., Hymen. p. 65 (1897). ♀ ♂.

This species seems to be spread over the whole of tropical Africa.

*Cyphononyx castaneus*, Klug.

- Pompilus castaneus*, Klug, Symb. physic. Dec. 4, 1834, t. xxxviii. fig. 9. ♀.  
*Pompilus rubescens*, Sm. Cat. Hym. B.M. iii. p. 136 (1855). ♀.

*Cyphononyx subauratus*, sp. n.

♀. Nigra; capite, antennis, prothorace, mesonoto, scutello, post-scutello, tegulis, pedibus, coxis exceptis, segmentisque abdominalibus quinto sextoque fulvo-ferrugineis; alis flavis, apice extremo anguste fuscis, venis flavo-testaceis.  
 Long. 16 mm.

♀. Clypeus narrowed towards the apex, the apical margin

widely and very shallowly emarginate, microscopically punctured; a few large punctures, from which spring black hairs, close to the apical margin. Second joint of the flagellum about half as long again as the third; the distance between the eyes on the vertex about equal to the length of the second joint of the flagellum; posterior ocelli as far from each other as from the eyes. Pronotum short, nearly four times as broad as its length at the sides, very shallowly arched posteriorly. Scutellum broad, not convex in the middle, postscutellum convex, not tuberculate. Median segment without lateral tubercles; gradually sloped posteriorly, not truncate; coarsely transversely striated. Sixth tergite with sparse setigerous punctures, broadly rounded at the apex, the setæ fulvous with a few black intermingled. The sulcus on the second sternite curved. Hind tibiæ very distinctly serrate, the inner calcar long, nearly half as long as the metatarsus. First recurrent nervure received distinctly before the apex of the second cubital cell, second at two-fifths from the base of the third cubital cell. Cubitus distinctly curved downwards from the second transverse cubital nervure; first transverse cubital very long and oblique as in *Hemipepsis*, the second cubital cell long and narrow; third abscissa of the radius about half as long again as the second. Cubitus of the hind wing originating just before the transverse median nervure. The fuscous border of the fore wing just touches the apex of the radial cell and thence is narrowed rapidly.

*Hab.* Mlanje, Nyasaland (*S. A. Neave*), November to February; Valley of Kola River, near Mt. Chipero, 1500–2000 ft., Portuguese East Africa (*S. A. Neave*), April.

This is very distinct from any other African *Cyphononyx*, resembling in colour *C. flavus*, Fabr., an Oriental species, but the shape of the second cubital cell shows an approach to *Hemipepsis*; the tarsal ungues, however, are the same as in *Cyphononyx*.

Type in B.M.

*Cyphononyx flavicornis*, Fabr.

*Sphex flavicornis*, Fabr. Spec. Insect. i. p. 450 (1781).

This is distinct from *bretonii*, Guér., having fulvous legs and no blue sheen on the abdomen. I look on *C. antennata*, Sm. (= *irenensis*, Cam. 1910), as merely a variety of this, differing in the colour of the head and thorax, which are mostly black in *antennata* and dull ferruginous in *flavicornis*; but colour varies in a similar manner in some other African



species. The locality Malabar given for *flavicornis* is evidently erroneous, but there are several mistaken localities among the Fabrician types in the Banksian collection.

*Cryptochilus gowdeyi*, sp. n.

♀. Nigra; femoribus basi nigris, tibiis tarsisque fulvo-aurantiacis, alis flavis, fulvo-tinctis, apice angustissime fusco-marginatis; unguiculis unidentatis.

♂. Feminae similis; unguiculis bifidis; postscutello conigero. Long., ♀ 25-32, ♂ 22-32 mm.

♀. Clypeus convex, the anterior margin broadly subtruncate, minutely punctured, with sparse large punctures interspersed, from each of which springs a long black hair. Second joint of the flagellum half as long again as the third; eyes separated on the vertex by a distance equal to about three-quarters of the length of the second joint of the flagellum. Head and thorax clothed with black hairs, scutellum and postscutellum not compressed, the former flat, the latter feebly convex. Median segment obliquely sloped on the apical portion, the oblique declivity not sharply separated from the dorsal surface; bluntly, roundly sub-tuberculate laterally at the base; the dorsal surface rather finely transversely striated, the striæ on the oblique slope much coarser. Abdomen shining, microscopically punctured, with a few larger punctures intermingled; sixth tergite closely punctured, densely clothed with fusco-ferruginous setæ; transverse groove of the second sternite deep and sinuate. Cubitus of the hind wing originating distinctly beyond the transverse median nervure. Radial cell of the fore wing obliquely truncate at the apex; second abscissa of the radius nearly as long as the first and third combined; first recurrent nervure received distinctly before the apex of the second cubital cell; second before the middle of the third cubital cell; submedian cell much longer than the median, the nervulus oblique. Hind tibiæ strongly serrate, tarsal ungues unidentate.

♂. Differs from the female in having the scutellum sub-tuberculate in the middle, the postscutellum raised into a large conical tubercle; the hind tibiæ are spinose, not serrate, the tarsal ungues strongly bifid. In both sexes the wings are yellow, clothed with minute fulvous hairs, which are much denser towards the base. Seventh tergite of the male broadly truncate at the apex; seventh sternite with a raised triangular area extending nearly to the apex.

*Hab.* Entebbe, Uganda (*C. G. Gowdey*), May to December; Mabira Forest (*C. G. Gowdey*), July; Buddu, west shore of Victoria Nyanza (*S. A. Neave*), September; Budongo Forest, Unyoro, 3400 ft. (*S. A. Neave*), December.

This splendid species is one of the few African *Cryptochilus* known to me in which the male has the unguis bifid as in *Cyphononyx*. Species showing this sexual difference are fairly numerous in India and the Malayan region, and one occurs in Madagascar. The tuberculate postscutellum of the male is remarkable in this species. It appears to be common in Uganda, but I have not seen specimens from any other locality.

Type in B.M.

The African species with dark wings, which have the tarsal unguis differing sexually as in *gowdeyi*, are:—

1. *Cryptochilus natalensis*, D. T.

*Pompilus obscurus*, Sm. Cat. Hym. B.M. iii. p. 140 (1855). ♀. (Nec *Pallosoma obscura*, Lep. 1845.)

*Salix natalensis*, D. T. Cat. Hymen. viii. p. 233 (1897).

2. *Cryptochilus severini*, Kohl.

*Priocnemis severini*, Kohl, Revue Zool. Afric. iii. p. 198 (1913). ♀.

3. *Cryptochilus anguliferus*, R. Lucas.

*Salix (Priocnemis) anguliferus*, Lucas, Deutsch. Ost-Afrika, iv., Hymen. p. 67 (1897). ♀.

I suspect that *anguliferus* and *severini* are identical.

*Pseudagenia pseudocyphononyx*, sp. n.

♀. Nigra, opaca; flagello, articulis duobus apicalibus infumatis, femoribus, basi extrema nigra, tibiis tarsisque fulvo-ferrugineis; mandibulis basi palpisque fusco-ferrugineis; alis nigro-violaceis. Long. 20 mm.

♀. Clypeus very broadly rounded at the apex, sparsely clothed with black hairs; antennæ long and slender, slightly exceeding three-quarters of the length of the insect, the first and second joints of the flagellum combined half as long again as the third joint. Eyes separated on the vertex by a distance equal to the length of the third joint of the flagellum; posterior ocelli much further from the eyes than from each other. Scutellum and postscutellum evenly convex, the sides

of the postscutellum distinctly obliquely striated. Median segment roundly depressed posteriorly, not truncate, distinctly transversely striated, with a median sulcus from the base, which becomes obsolete near the apex. First tergite a little longer than its apical breadth, very rapidly broadened from the base; transverse furrow of the second sternite situated near the base; sixth tergite closely punctured. Second abscissa of the radius long, equal to the third, first recurrent nervure received at three-quarters from the base of the second cubital cell, second at the middle of the third cubital cell; third transverse cubital nervure oblique. Cubitus of hind wing received just beyond the transverse median nervure. Spines of the fore metatarsus very short; hind tibiæ almost smooth, the spines microscopic.

*Hab.* Mlanje, Nyasaland (*S. A. Neave*), January 1913.

Very similar superficially to the common *Cyphononyx optimus*, Sm., but differs generically, also in the colour of the flagellum.

### *Pseudagenia esau*, Kohl.

*Pseudagenia esau*, Kohl, *Revue Zool. Afric.* iii. p. 200 (1913).

A form which I take to belong to this fine species occurs at Mlanje, Nyasaland. It is entirely black, but otherwise answers fairly well to the description. The antennæ are shorter and stouter than is usual in the genus, not "tenues," as in the description, and the position of the cubitus of the hind wing is variable, sometimes interstitial as in Kohl's type, sometimes originating distinctly beyond the transverse median nervure.

### Genus *CRYPTOSALIUS*, Turn.

*Cryptosalius*, Turn. *Trans. Ent. Soc. London*, p. 76 (1917).

Allied to the Indian species typical of this genus are several African species which may conveniently be included in the genus.

#### 1. *Cryptosalius robustus*, Cam.

*Pseudagenia robusta*, Cam. *Rec. Albany Museum*, i. p. 136 (1904). ♀.

In structure this is closely allied to *C. rava*, Bingham, the type of the genus, differing in the shorter inner branch of the bifid tarsal unguis, in the arcuate hind margin of the pronotum, and in the lesser development of the frontal prominence above the base of the antennæ, but agreeing in the

rather abruptly truncate median segment with a distinct longitudinal sulcus on the dorsal surface. This group is separated from *Calopompilus*, Ashm., by the bifid tarsal unguis and by the form of the third cubital cell, which is shorter than the second; not much longer, as in *Calopompilus*, to which, however, the genus is much more nearly related than to *Pseudagenia*.

Less closely related to *C. rava*, differing in the absence of a sulcus on the median segment and in the coarsely rugose or reticulate sculpture of the dorsal surface of that segment, are the following :—

2. *Cryptosalix contristans*, sp. n.

♀. Nigra; propleuris fusco-ferrugineis; alis fuscis, cæruleo-suffusis, anticis macula magna ovata hyalina ante apicem.  
Long. 15–18 mm.

♀. Clypeus short, slightly convex, broadly truncate at the apex. Head opaque, very closely microscopically punctured; the front triangularly prominent between the antennæ, with a shallow sulcus not reaching the anterior ocellus. Inner margins of the eyes parallel below, distinctly convergent above towards the vertex; posterior ocelli as far from each other as from the eyes. Antennæ rather stout, a little longer than the head, thorax, and median segment combined, the second joint of the flagellum a little shorter than the third. Temples very narrow. Thorax shallowly and sparsely punctured, with close microscopic punctures between; the mesopleuræ coarsely punctured, with irregular ill-defined striæ; the pronotum very broadly arched posteriorly, the sides almost parallel, the anterior margin almost straight; mesonotum longer than the pronotum; scutellum with a distinct longitudinal carina, the dorsal surface flat and triangular. Median segment short, much broader than long, the posterior slope oblique, not sharply divided from the dorsal surface, without lateral tubercles, the dorsal surface very coarsely rugose-reticulate, the posterior slope strongly transversely striated, the sides of the segment more finely and irregularly vertically striated. Abdomen opaque, somewhat elongate; the sixth tergite elongate-triangular, narrowly rounded at the apex; the transverse sulcus of the second sternite situated very near the base. Second abscissa of the radius at least half as long again as the third, the fourth a little longer than the second; submedian cell much longer

than the median ; recurrent nervures received very near the middle of the second and third cubital cells ; cubitus of the hind wing interstitial. Fore tarsi and hind tibiæ almost entirely unarmed ; inner spur of the hind tibiæ fully half as long as the hind metatarsus ; tarsal ungues strongly bifid.

*Hab.* Mlanje, Nyasaland (*S. A. Neave*), January 1913.

### 3. *Cryptosalius indocilis*, sp. n.

♀. Nigra, opaca, argenteo-pruinosa ; alis hyalinis, anticis late fusco bifasciatis, apice angustissime fuscis.

*Var.* Capite pedibusque fusco-ferrugineis.

Long. 18–20 mm.

♀. Very similar in structural details to *contristans* ; the antennæ stout, more or less covered with very delicate silver pubescence, which is also visible on the abdomen ; the dorsal surface of the thorax rather less minutely punctured, giving the appearance of very fine granulation ; mesopleuræ rugose. Median segment, abdomen, and legs as in *contristans*. Second abscissa of the radius almost twice as long as the third. The first fuscous fascia of the fore wing runs along the basal nervure, broadening rapidly from the costa ; the second is very broad, filling the whole of the second and third cubital cells, the radial cell except the extreme apex, the apex of the first cubital cell, the apex of the first discoidal cell, the second discoidal cell except the base, and the base of the third discoidal cell.

*Hab.* Mlanje, Nyasaland (*S. A. Neave*), December 1913 and January 1914.

Except in the very different colouring of the wings the differences between this and *contristans* are very small.

### *Cryptosalius perluctuosus*, sp. n.

♀. Nigra, opaca ; pedibus fusco-ferrugineis ; alis hyalinis, anticis fusco bifasciatis.

Long. 12 mm.

♀. Very similar in structure to the two last species, differing in the following points :—Eyes nearer together on the vertex, the posterior ocelli being half as far again from each other as from the eyes ; pronotum fully as long as the mesonotum, the sculpture of the thorax fine as in *contristans* ; pleuræ sparsely punctured, the punctures large ; sides of the median segment delicately striated, with sparse punctures ; scutellum without a carina. The second fascia of the fore wing is much narrower than in *indocilis*, occupying the radial

cell except the extreme apex, the second and third cubital cells, and the apical third of the second discoidal cell.

*Hab.* S.W. of Lake Chilwa, Nyasaland (*S. A. Neave*), January 1914.

*Cryptosalius elgonensis*, sp. n.

♀. Fusco-ferruginea; mesonoto, abdomine flagelloque nigris; alis subhyalinis, anticis fusco bifasciatis.

*Var.* Mesonoto fusco-ferrugineo.

Long. 10–11 mm.

♀. Posterior ocelli a little nearer to the eyes than to each other. Head and thorax closely microscopically punctured, the mesonotum nearly twice as long as the pronotum in the middle; propleuræ with microscopic oblique striæ, mesopleuræ with large sparse punctures interspersed with the minute puncturation. Carina of the scutellum almost obsolete. Median segment, legs, and neuration as in *perluctuosus*; fasciæ of the fore wing as in that species, the second fascia a little broader in the discoidal cells.

*Hab.* Southern slopes of Mt. Elgon, 5100–5800 ft. (*S. A. Neave*), June 1911; Daro Forest, Toro, Uganda Protectorate, 4000–4500 ft. (*S. A. Neave*), October 1911.

The pronotum is much shorter than in the allied species.

XLII.—*Notes on Fossorial Hymenoptera*.—XXXV. On new Sphecoidea in the *British Museum*. By ROWLAND E. TURNER, F.Z.S., F.E.S.

PROTOSTIGMUS, gen. nov.

Head large, much broader than the thorax. Eyes reaching the base of the mandibles, their inner margins almost parallel. Mandibles bidentate at the apex. Antennæ inserted very low down near the apical angles of the clypeus; scape long, rather less than half as long as the flagellum. Pronotum short, narrower than the mesonotum, rounded at the angles, the calli reaching back to the tegulæ; median segment short and small, opaque and without coarse sculpture. Abdomen not petiolate. Fore tarsi unarmed; hind tibiæ almost smooth, very feebly serrate towards the apex. Stigma large, more than twice as long as the greatest breadth, much smaller than in *Ammoplanus*. Radius

originating near the middle of the stigma; the first abscissa of the radius short, scarcely more than half as long as the breadth of the stigma; an oblique vein from the apex of the stigma meeting the radius and closing the radial cell, the radius not continued beyond this vein, the space between the transverse cubital nervure and the oblique vein a little more than twice as long as the first abscissa of the radius. First cubital cell receiving the only recurrent nervure well before the apex; second cubital cell very small, with a short petiole, triangular, the cubital margin a little longer than the first abscissa of the radius. Median cell longer than the submedian.

*Protostigmus championi*, sp. n.

♂. Niger; mandibulis, scapo, tibiis anticis, tarsisque pallide flavis; flagello, tibiisque intermediis posticisque basi brunneo-flavis; alis hyalinis, iridescentibus, venis pallidis, stigmate fusco-ferrugineo.

Long. 2.7 mm.

♂. Clypeus subcarinate longitudinally, triangularly produced and almost pointed at the apex. First joint of flagellum longer than the second and third combined; joints 2-5 broader than long, thence gradually lengthening and becoming thicker to the apex. Front flat, obliquely sloped from a little below the anterior ocellus; posterior ocelli



*Protostigmus championi*, sp. n.

nearer to the hind margin of the head than to each other, but nearer to each other than to the eyes. Head, thorax, and abdomen smooth and shining; median segment opaque, very finely granulate, subcarinate longitudinally in the middle, much broader than long, narrowed to the apex, the sides and the apical slope almost smooth, shining, the latter with a median sulcus.

*Hab.* Kairouan, Tunisia (*G. C. Champion*), May 3, 1913.

This genus is very distinct in the shortened radial cell and petiolated second cubital cell from *Stigmus* and other related genera, but is to be placed in the same subfamily. Except for the neuration it is very near *Ammoplanus*.

*Spilomena indostana*, sp. n.

♀. Nigra; mandibulis, antennis, callis humeralibus, tegulis pedibusque pallide flavis; alis hyalinis, venis testaceis, stigmate fusco.

Long. 3 mm.

♀. Mandibles bidentate at the apex, the inner tooth broad and blunt; clypeus very strongly convex in the middle. Antennæ inserted low down by the sides of the clypeus, the scape fully half as long as the flagellum, first joint of the flagellum longer than broad, shorter than the second joint. Eyes distinctly divergent towards the clypeus, posterior ocelli nearer to each other than to the eyes. Head broader than the thorax, narrowed behind the eyes. Head and thorax slightly shining, microscopically punctured, the pronotum narrower than and below the level of the mesonotum. Median segment coarsely and closely reticulate, with two longitudinal carinæ near the middle, the space between the carinæ transversely striated; the sides of the segment closely obliquely striated, the apical slope granulate. Abdomen smooth and shining. Recurrent nervure interstitial with the first transverse cubital nervure; second cubital cell rectangular, the radial and cubital margins distinctly longer than the transverse cubital nervures. Stigma smaller and narrower than in *S. troglodytes*, Lind. Legs unarmed.

*Hab.* Bombay district (*Dr. Leith*).

Differs from *S. obliterated*, Turn., in the sculpture of the median segment, the colour of the nervures, and the presence of the first transverse cubital nervure.

*Chlorion (Proterospheæ) nyanzæ*, sp. n.

♂. Niger; mandibulis in medio obscure fusco-ferrugineis; segmento mediano albido-hirsuto; alis fusco-hyalinis, cæruleo suffusis.

♀. Mari simillima.

Long., ♂ 19, ♀ 24 mm.

♂. Clypeus convex, with a longitudinal carina from the base to the middle; covered with short silver pubescence, intermingled with which are long black hairs. Eyes distinctly converging towards the clypeus, separated on the vertex by a distance about equal to the combined length of the two basal joints of the flagellum plus half the length of the third joint; the posterior ocelli nearer to each other than to the eyes. Pronotum short, not impressed in the middle,



the mesonotum rather thickly clothed with short black hairs. Scutellum subopaque, with an almost obsolete longitudinal impression; postscutellum without an impressed line. Median segment clothed with very short silver pubescence, and with long whitish hairs; the segment beneath the pubescence very finely transversely rugulose; the sides of the segment sparsely and shallowly punctured, with sparse black hairs. Petiole as long as the second joint of the hind tarsi; seventh tergite rather broadly truncate at the apex. Sternites sparsely clothed with long black hairs which become denser on the sides, eighth sternite narrowly rounded at the apex, with a longitudinal carina. First recurrent nervure received at about three-quarters from the apex of the second cubital cell, sometimes a little nearer to the apex.

♀. Sixth tergite narrowly rounded at the apex; sixth sternite convex, narrowly rounded at the apex, the hairs on the sternites short and very sparse.

*Hab.* Entebbe, Uganda (*C. G. Gowdey*), May to January; N.W. shores of Victoria Nyanza (*S. A. Neave*), September; Bukoba, German East Africa (*C. G. Gowdey*), June.

Nearly related to *C. hæmorrhoidalis*, Fabr. (*volubilis*, Kohl), but may be distinguished from the variety of that species with black legs by the white hairs and pubescence of the median segment and by the position of the first recurrent nervure, which in *hæmorrhoidalis* is interstitial with the second transverse cubital nervure; the apical tergite of the male is also much broader at the apex.

*Chlorion (Proterospha) rufiscutis*, sp. n.

♀. Nigra; mandibulis basi, clypeo, antennis, articulis 5 apicalibus exceptis, pronoto, tegulis, scutello, postscutello, pedibusque, coxis exceptis, ferrugineis; fronte clypeoque dense aureo-pubescentibus; alis hyalinis, venis ferrugineis, anticis margine apicali late infumatis.

♂. Feminae similis; flagello, clypeo basi, pronoto, scutello, postscutello, trochanteribus femoribusque basi nigris.

Long., ♀ ♂, 22 mm.

♀. Clypeus and front sparsely clothed with long fulvous hairs, which stand out from among the short golden pubescence. Inner margins of the eyes parallel; posterior ocelli scarcely as far from the eyes as from each other; eyes separated on the vertex by a distance equal to the length of the second joint of the flagellum plus half of the third joint. Scutellum with a delicate impressed longitudinal line which does not reach the base or the apex, strongly convex; post-

scutellum convex, feebly bituberculate. Median segment clothed with long whitish hairs which are denser on the apical and lateral surfaces than on the dorsal, finely and closely transversely striated. Petiole about as long as the second joint of the hind tarsi; abdomen pruinose, the apical margins of the segments brownish. Third abscissa of the radius shorter than the first. Comb of the fore tarsi long and very slender, fore metatarsus with ten long spines on the outer side and apex.

♂. Very similar to the female, but the pubescence on the face and clypeus paler; the petiole half as long again as the second joint of the hind tarsi; seventh tergite very broadly subtruncate at the apex; seventh sternite widely and shallowly emarginate; the eighth produced into a point at the apex, subcarinate longitudinally in the middle, the sides slightly sinuate.

*Hab.* Sinapunge, North Rhodesia (*O. Silverlock*), February 1911, ♀ ♂; Valley of N. Rukuru, Karonga, Nyasaland, 2000–4000 ft. (*S. A. Neave*), July 1910, ♀ ♂.

The eighth sternite of the male is shaped somewhat as in *malagassus*, Sauss., but is more distinctly pointed. The colouring of the female is very similar to that of *gorgon*, Kohl, but the sculpture of the median segment is very different; the postscutellum is also similar to that of *gorgon*, but the pronotum has a median sulcus in *rufiscutis* which is absent in *gorgon*.

*Chlorion (Proterosphex) observabilis*, sp. n.

♀. Nigra, robusta; pleuris, mesosterno segmentoque mediano dense pallido-aureo-pubescentibus; alis fusco-hyalinis, venis nigris.

Long. 26–30 mm.

♀. Clypeus with sparse long black hairs, closely covered with pale golden pubescence, convex; eyes separated on the vertex by a distance greater than the combined length of the two basal joints of the flagellum. Ocellar space slightly depressed, the posterior ocelli much nearer to each other than to the eyes. Vertex sparsely clothed with long black hairs, the temples with long pale golden hairs. Pronotum short, transverse; mesonotum opaque, rather closely clothed with short black hairs; scutellum shining, with a shallow longitudinal impression; postscutellum without a groove. Median segment, pleuræ, and mesosternum densely covered with very pale golden pubescence, with long hairs of the same colour

intermingled. Petiole short, as long as the third joint of the hind tarsi; abdomen subopaque.

*Hab.* Tero Forest, S.E. Buddu, Uganda, 3800 ft. (*S. A. Neave*), September 1911.

This is a stoutly built species allied to *bohemanni*, Dahlb., but differing in the pubescence of the median segment, pleuræ, and mesosternum. The wings are also much paler and only faintly tinted with blue.

*Chlorion (Proterospheæ) bohemanni*, Dahlb.

*Spheæ bohemanni*, Dahlb. Hymen. Europ. i. p. 436 (1845). ♂.

*Spheæ kilimandjaroensis*, Cameron, Sjöstedt, Kilimandjaro-Meru Exped. ii. p. 262 (1910). ♀ ♂.

*Spheæ transvaalensis*, Cam. Ann. Transvaal Mus. ii. p. 140 (1910).

*Hab.* E. Africa, from Natal to Uganda; Pretoria (*Distant*); Mlanje, Nyasaland (*S. A. Neave*), November to March; Mt. Rungwe, near New Langenburg (*S. A. Neave*), November; Mt. Kokanjero, S.W. of Elgon, Uganda Protectorate (*S. A. Neave*), August.

*Chlorion (Proterospheæ) schoutedeni*, Kohl.

*Spheæ schoutedeni*, Kohl, Rev. Zool. Afric. iii. p. 205 (1913). ♂.

*Hab.* Mlanje, Nyasaland (*S. A. Neave*), March to June 1913.

*Chlorion (Harpactopus) tyrannus*, Sm.

*Harpactopus tyrannus*, Sm. Cat. Hym. B.M. iv. p. 264 (1856). ♀.

*Spheæ vagus*, Rad. Journ. acad. sc. math. Lisboa, viii. p. 209 (1881). ♂.

*Philanthus ramakrishnæ*, sp. n.

♀. Nigra; capite maximo; clypeo, orbitis dimidio inferiori latissime, macula obliqua utrinque inter antennas, macula frontali mediana, vertice macula parva utrinque, linea obliqua pone oculos, pronoto postice, tegulas, mesopleuris maculis duabus, scutello macula magna utrinque, segmento mediano macula magna basali utrinque maculaque elongata apicali utrinque, tergito primo fascia lata apicali interrupta, tergitis 2-5 fascia angusta apicali, sternitis 2-4 macula transversa apicali utrinque, coxis macula apicali, femoribus macula apicali, tibiis tarsisque flavis; alis hyalinis, leviter infuscatis, venis fuscis.  
Long. 14 mm.

♀. Head very large, broader than the thorax; clypeus deflexed from the middle, the apical margin produced in the  
*Ann. & Mag. N. Hist. Ser. 9. Vol. i.* 24

middle and rounded. Eyes touching the base of the mandibles, strongly divergent towards the clypeus, separated on the vertex by a distance equal to about twice the combined length of the two basal joints of the flagellum; posterior ocelli much nearer to each other than to the eyes. Clypeus shining, sparsely punctured; front finely and very closely punctured; vertex and thorax more strongly punctured. Basal area of the median segment smooth and shining, divided by a broad longitudinal groove; the apical slope steep, finely and very closely punctured. Abdomen minutely and closely punctured, the ventral surface much more coarsely and very sparsely punctured. Fore metatarsus with six spines.

*Hab.* Bababuddin Hills, Mysore, 4700 ft. (*T. V. Ramakrishna*), June 1, 1915.

Not very near any other species; the head is much larger than in *P. basalis*, Sm., and the median segment is shorter and very different in sculpture. In *P. dentatus*, Cam., the head is as large, but the clypeus and median segment are very different.

*Motes rugifera*, sp. n.

♀. Nigra; femoribus posticis ferrugineis; tarsis subtus brunneis; alis hyalinis, leviter infumatis, venis fusco-ferrugineis; unguiculis denticulatis.

Long. 11 mm.

♀. Clypeus clothed with delicate silver pubescence; third joint of the flagellum twice as long as the first, the second distinctly shorter; eyes separated on the vertex by a distance about equal to the length of the third joint of the flagellum. Pronotum obliquely depressed, with a shallow longitudinal median line, the middle of the hind margin level with the mesonotum. Thorax opaque, scutellum and postscutellum shining. Median segment longer than broad, narrowed towards the apex; the dorsal surface coarsely, rugosely, transversely striated, with a distinct longitudinal carina; the sides of the segment closely obliquely striated; the face of the posterior truncation indistinctly transversely striated, with a deep median sulcus. Tergites 1-3 with a broad but ill-defined apical band of dull whitish pubescence; sixth tergite bare, delicately punctured, narrow, the sides converging towards the apex, which is very narrowly truncate; second sternite not swollen at the base. Radial cell obliquely truncate at the apex; first abscissa of the radius as long as the second and third combined. Tarsal ungues long, with a

well-defined tooth near the middle. Comb of fore metatarsus almost obsolete.

*Hab.* Mabira Forest, Uganda (*C. G. Gowdey*), July 1913.

This is a true *Motes*, not one of the *cræsus* group of *Notogonia*.

*Tachysphæx fulvicornis*, sp. n.

♀. Nigra; mandibulis, apice excepto, clypeo dimidio apicali, antennis, tibiisque tarsisque anticis fulvo-ferrugineis; alis hyalinis, venis fusco-ferrugineis.

Long. 7 mm.

♀. Clypeus short, broadly truncate at the apex, the anterior margin strongly depressed. Head and thorax closely and very delicately punctured-rugulose; antennæ slender; second and third joints of the flagellum equal, each twice as long as the first joint. Eyes separated on the vertex by a distance slightly exceeding the combined length of the two basal joints of the flagellum. Thorax opaque; pronotum oblique, showing a distinct transverse dorsal surface, which is only slightly below the level of the mesonotum. Median segment much broader than long, abruptly truncate posteriorly; the dorsal surface coarsely longitudinally rugose-striate in the middle, finely punctured-rugulose on the sides; the apical slope finely and closely punctured, with a deep median groove; the sides of the segment obliquely striated. Abdomen finely shagreened; the two basal tergites with transverse spots of white pubescence at the apical angles; pygidial area elongate-triangular, slightly convex, finely and closely punctured. Comb of the fore tarsi long and slender; tarsi not unusually short, the fourth joint longer than broad. Wings rather short, the radial cell broadly truncate at the apex; third abscissa of the radius twice as long as the second, third cubital cell less than half as long again on the cubitus as on the radius.

*Hab.* Chapra, Bihar (*Mackenzie*).

Easily distinguished from other black *Tachysphæx* by the colour of the antennæ, the sculpture of the median segment, and the dull opaque surface of the whole insect.

*Trypoxylon fletcheri*, sp. n.

♀. Nigra; abdomine rufo-ferrugineo; trochanteribus posticis, femoribus posticis dimidio basali, tibiis supra nigro-suffusis, tarsisque anticis intermediisque ferrugineo-testaceis; alis hyalinis, iridescentibus, venis fuscis.

Long. 8 mm.

♀. Head opaque; the clypeus covered with silver pubescence, with two small teeth in the middle of the apical margin. Eyes separated at the base of the clypeus by a distance not quite equal to the combined length of the two basal joints of the flagellum, and by about the same distance on the vertex; posterior ocelli very narrowly separated from the eyes, distinctly larger than the anterior ocellus. Flagellum thickened from the base to the apex, the first joint globular, the remaining joints longer than broad; the front longitudinally impressed below the anterior ocellus, produced into a minute tubercle between the antennæ, very finely and closely punctured. Thorax subopaque, minutely punctured; median segment smooth and shining, with a median longitudinal furrow, but no lateral furrows. Abdomen shining, very minutely punctured; the first segment longer than the second and third combined, the basal half forming a petiole, the apical half very gradually widened to the apex, where it is about half as broad as the apex of the second segment; the third about equal in length to the second and distinctly broader. Hind tibiæ without spines.

*Hab.* Shillong, Assam, 5000 ft. (*T. Bainbrigge-Fletcher*), October 1916.

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### XLIII.—*Notes on Petrodromus and Rhynchocyon.*

By OLDFIELD THOMAS.

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I OWE to the kindness of Mr. Ernest Warren, of the Natal Museum, Pietermaritzburg, the opportunity of examining a number of small mammals which had been sent to that museum from various South-African localities. Among them I may record an example of the rare *Otomys laminatus*, Thos. & Schw., from Induku-duku, near Umfolozi, and a *Petrodromus* from Manguzi, N. Zululand, the latter being the first-known occurrence of the genus south of the boundary of Portuguese S.E. Africa. This southern *Petrodromus* appears to represent a new subspecies, which may be called

*Petrodromus tetradactylus warreni*, subsp. n.

General essential characters of true *tetradactylus*, but colour greyer and less buffy throughout. Back with the buffy suffusion at a minimum, sides and hips clear grey,

lower flanks with only a slight indication of the buffy so strongly developed in this region in *tetradactylus*. Under surface as white as in *venustus*, not washed with buffy, as is usual (though not invariable) in *tetradactylus*; chin, however, of the single specimen quite buffy. Facial markings less developed than in *tetradactylus*, the light line over the eye broader, vaguer, and less sharply contrasted; the usual large continuous dark patch behind it broken into two and much less conspicuous. Upper surface of hind feet pale brown, as in *tetradactylus*, not so whitish as in *venustus*.

Skull as in *tetradactylus*, with average palatal vacuities.

Dimensions of the type (taken by collector in the flesh):—

Head and body 191 mm.; tail 155; hind foot 56 (also 56 dry); ear 37.

Skull: greatest length 52.4; condylo-basal length 50; zygomatic breadth 27; upper tooth-series 27.5.

*Hab.* (of type). Manguzi, N. Zululand (6 miles from coast and about the same distance south of the Portuguese frontier).

*Type.* Young adult male. B.M. no. 18.4.9.1. Original number 86. Collected November 1905 by Mr. Toppin for the Natal Museum, and presented to the British Museum by the latter.

This *Petrodromus* differs from true *P. tetradactylus* by its much greyer and less buffy coloration and its less conspicuous face-markings. In distribution it would seem to be separated, so far as we know at present, from the area of *tetradactylus* by about 6 degrees of latitude, that animal not being hitherto recorded south of 21° S., while the intermediate area is occupied by *P. (Cercoctenus) schwanni*.

In connection with the determination of the Zululand *Petrodromus*, I have made a renewed examination of the considerable series in the Museum, with a view to finding out how far Mr. Hollister's \* recent erection of a genus for *P. sultan* and *schwanni*, the species with bulbous tail-bristles, is supported by this material, and especially what is the bearing on this distinction of *P. rovomæ*, so intermediate between the others in its essential characters.

Of the characters of "*Cercoctenus*" recorded by Hollister, those of the bulbous bristles and less imperfect palate are undoubtedly valid, but those drawn from  $p^1$  and  $p^4$  do not appear to be at all constant—the "spikelet" on  $p^1$  is present in several of our *P. sultan* and many of our *P. schwanni*, while the reputed greater complexity of  $p^4$  is not true as

\* Smiths. Misc. Coll. vol. lxvi. p. 1 (1916).

compared to many of our large series of *P. tetradactylus*. On the other hand, I may note, as a further character in *P. sultan*, that the anterior incisors are longer and more dominant as compared to the teeth behind them than they are in other species. But even this character is not true of *P. schwanni*, and is equalled in *P. robustus*.

Then, as to *P. rovumæ* and the forms allied to it, I find among the six skulls I refer to the group a variation in the condition of the palate extending over the whole gamut shown by typical *Petrodromus* on the one hand and *Cercoctenus* on the other, the original specimens from the Rovuma having the palate as imperfect as in the former, while one, which I believe to represent *P. nigriseta*, Neum., from Mandera, E. Africa, has it as complete as in the latter.

With regard to the caudal bristles, some specimens of "*Cercoctenus*" *sultan* have them, or, at least, some of them, hardly more knobbed than in *P. rovumæ*, and, on the other hand, some of those of *P. rovumæ* are scarcely more thickened than in the less hairy-tailed forms of true *Petrodromus*.

In view, however, of the way the species overlap geographically, and of the apparently superspecific value of the bristle structure, I would suggest that three subgenera should be recognized—the typical *Petrodromus* (genotype *P. tetradactylus*), characterized by its perfectly normal tail-hairs, a new subgenus *Mesoctenus* (genotype *P. rovumæ*), with thickened and partially differentiated bristles, and *Cercoctenus* (genotype *P. sultan*), with its bristles knobbed and fully differentiated from the other hairs of the tail\*.

\* It is difficult to enter into the mind of an author (A. Roberts, Ann. Transv. Mus. iv. p. 69) who in 1913 stated that the knobs on the caudal bristles of *P. schwanni* were "probably" due to singeing in grass fires. Of course, forty years ago, when the first specimen of *P. sultan* came, this idea presented itself and was considered, but was even then disprovable by the different lengths, *inter se*, of the bristles, of which fresh ones could be seen pushing up fully formed, among the bases of the longer ones. But now, when dozens of examples of *Petrodromus* with knobbed bristles have been recorded, one can only wonder how Mr. Roberts supposes that every individual singes its tail in exactly the same part and to the same extent.

Mr. Roberts has also given new names to Beira and N.W. Rhodesian forms of *Petrodromus*, of both of which the British Museum possesses topotypes. In the case of the former it seems true that Beira and Gorongosa specimens may be recognized as distinct from those of the Zambezi by their larger size, darker feet, and buffy thighs. But, if this be so, it is certain that the Chirinda series, put in with *tetradactylus* by Mr. Roberts in defiance of the geography of the case, should not be included in that species, but be either *beira* or distinct. Personally I believe them to be the latter, and have described them below.

With regard to *occidentalis*, it does not appear that the reputed differences in size hold good, and the name should apparently be synonymized



The following new forms also appear to need description :—

*Petrodromus robustus*, sp. n.

Similar to *venustus*, but larger and with more powerful muzzle and incisors.

Size rather greater than in *venustus*, the feet stouter. Colour about as in that animal, though not so pale as in the most extreme specimens; feet similarly whitish instead of brown as in *tetradactylus*. Under surface of type white almost without buffy suffusion; the hairs slaty at base. A patch on the chest drabby, but this may be either glandular or artificial, like the chest-staining found in many African small mammals, and often mistaken by ignorant workers for a natural character. Tail well-haired, black except for its basal third below, where it is dull whitish.

Skull very stout and heavy, larger than in any true *Petrodromus*, and only equalled by that of *P. (Cercotenus) sultan*. The muzzle is long and broadened in front, where it contains the large anterior incisors, not evenly tapering forwards as is usual. Nasals also broader. Palate with the large vacuities characteristic of true *Petrodromus*. Parapterygoid fossæ very broad, the breadth across the pterygoids 10 mm., a breadth only approached in other species when long lateral spines are developed, which is not the case here. The lines of the outer edges of the ectopterygoids, if produced forwards, meet at an angle of about  $55^{\circ}$ , while this angle is ordinarily about  $40^{\circ}$  in *tetradactylus* and  $43^{\circ}$ – $47^{\circ}$  in *venustus*, but, of course, there is a good deal of variation in individual cases.

Anterior incisors conspicuously larger than in any other of the allied species, only equalled in length, though not in thickness, by those of *P. (Cercotenus) sultan*; their length 5 mm. and their greatest diameter 2.2; their height fully double that of  $i^3$  and the canine. Other teeth broad and stout;  $p^3$  as broad posteriorly as anteriorly.

Dimensions of the type (measured in flesh by collector):—

Head and body 193 mm.; tail 178; hind foot 57.5 (56.5 dry); ear 38.

Skull: greatest length 57; condylo-basal length 53.2;

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with *venustus*. In the measurements given it is not clear whether "bas. leng." means basal or basilar length, while it is clear that "molar series" includes premolars as well as molars.

I regret to have to recur to the character of Mr. Roberts's mammal work, but accident having necessitated my working on the same things from the same region, I should not be doing my duty if I took the easy course and refrained from commenting on the harm such work is likely to do to the mammalogy of the countries concerned.

zygomatic breadth 31·3 ; breadth of muzzle above  $i^3$  8·8 ; nasals  $20\cdot5 \times 4\cdot2$  ; interorbital breadth 9·4 ; breadth of brain-case 21 ; palatal length 32 ; anterior palatal foramina 6·9 ; breadth of palate outside  $m^1$  19·7. Upper tooth-series 29·3 ; front of  $p^4$  to back of  $m^2$  11.

*Hab.* Katanga, Southern Congo basin. Type from the Upper Lufira River. Alt. about 3600'.

*Type.* Adult male. B.M. no. 7. 12. 13. 7. Collected 21st June, 1907, by Mr. S. A. Neave.

Comparison with about forty skulls of *Petrodromus* (s. s.) from all parts of the range of the genus shows that this animal from the north side of the Congo-Rhodesian watershed stands out markedly from all of them by its heavy muzzle and large anterior incisors. Although adult the type is by no means old, its teeth being but little worn. Many male specimens with teeth more worn are among those with which I have compared it.

With regard to *P. venustus* itself, I am somewhat doubtful if it ought not, like the Zululand form above described, to be considered as a subspecies of *P. tetradactylus*, some of the Nyasa specimens being more or less intermediate between the two. But this question may be left for further material to decide.

*Petrodromus tetradactylus swynnertoni*, subsp. n.

General colour rather dark as compared with specimens from Gorongosa and Beira, the cinnamon or hazel area of the back less bright, the grey of the flanks more smoky, and the buffy edging of the belly darker. Belly-hairs generally washed with buffy. Upper part of thighs much greyer and less buffy, the buffy of the flanks scarcely continued on to them. In the other form this region is prominently buffy. Upper side of hind feet rather lighter, though not so whitish as in *venustus*.

Dimensions of the type (measured on skin):—

Head and body 200 mm. ; tail 164 ; hind foot 53.

Skull : greatest length 52 ; condylo-basal length 49 ; zygomatic breadth 26·5 ; nasals  $20\cdot5 \times 3\cdot6$  ; breadth of brain-case 19·4 ; upper tooth-series 27·2 ;  $p^4$  and two molars 9·7.

*Hab.* Chirinda Forest, Melsetter, S. Rhodesia. Alt. 3900'.

*Type.* Adult male. B.M. no. 8. 7. 19. 10. Original number 58. Collected 26th June, 1906, by C. F. M. Swynnerton, Esq., and presented by him to the National Museum. Eleven specimens.

This race of *Petrodromus* is readily distinguishable from

the form next north of it, that of Beira and Gorongosa, by its generally duller coloration, and especially by the practical absence of the prominent buffy on the thighs. I have named it in honour of its donor, to whom we owe such interesting series of the mammals of the Chirinda Forest.

*Petrodromus (Mesoctenus) mossambicus*, sp. n.

Most nearly allied to *P. rovuæ*, but the palate much more complete and the belly-hairs not white to their bases.

Size and general characters quite as in *P. rovuæ*. Colour apparently as in that species in most respects, but, as the specimens of both are in spirit, no exact comparison is possible. It is, however, evident that while in the type of *rovuæ* the belly-hairs are white quite to their bases, that of *mossambicus* has, as is usual in the genus, the bases of all the ventral hairs slaty. In both the chin-hairs are completely white and those of the chest slaty-based. Rump broadly naked, or, rather, clothed with an exceedingly fine pubescence quite different from the general fur.

Skull with its palate about as complete as in average female\* specimens of *Cercoctenus*, markedly more perfect than in *rovuæ*, in which the vacuities are as large as or larger than in *Petrodromus* (s. s.). Other characters as in that species. Ectopterygoids rather narrow, the lines of their outer edges making an angle of about 40°.

Dimensions of the type (measured on the spirit-specimen):—

Head and body 170 mm.; tail 148; hind foot 49·5; ear 31.

Skull: greatest length 50·5; condylo-basal length 47; zygomatic breadth 26·5; nasals 20 × 3·8; interorbital breadth 9; palatal length 28·7; breadth across pterygoids 7·5; upper tooth-series 26·5;  $p^4$  and two molars 9.

*Hab.* Cabaceira, Mozambique.

*Type.* Adult female in spirit. B.M. no. 64.12.6.1. Collected and presented by Sir John Kirk.

This is the female specimen recorded as *P. rovuæ* "without exact history" in my original description of that animal. But I have since found out that it came from Cabaceira, a distance from the Rovuma quite sufficient to render the differences above noticed worthy of recognition. From *P. (M.) nigriseta*, Neum., to which I assign a specimen from

\* Throughout the group male skulls have on the average rather more complete palates than female, though there are many exceptions to this rule.

Mandera, East Africa, it is distinguishable by its broadly naked rump, that region in *nigriseta* being about as hairy as in ordinary *Petrodromus*.

#### RHYNCHOCYON.

Since in *Rhynchocyon* there are three conspicuously different types of coloration—those of the *cirnei*, *petersi*, and *chrysopygus* groups respectively,—it seemed likely that a close examination of the skulls would indicate the advisability of a triple subdivision of this genus also. Such, however, proves to be only partially the case, for the natural grouping would appear to be into two, as follows :—

#### RHYNCHOCYON, s. s.

Back with a chess-board pattern ; ground-colour some shade of grey, rarely a little rufous.

Outer upper incisor normally deciduous.

Genotype. *R. cirnei*, Peters.

#### RHINONAX, subgen. nov.

Back without chess-board pattern. Ground-colour deep rufous or chestnut, the posterior back yellow or black.

Outer upper incisor normally permanent.

Genotype. *R. chrysopygus*, Günth.

Also contains *R. petersi* and its allies.

The fact that the character of the permanence or otherwise of the upper incisor is not absolutely constant in either subgenus, a small proportion of the skulls of each providing exceptions to the rule, induces me to treat these groups merely as subgenera, and not full genera.

I may take this opportunity formally to select B.M. no. 80. 11. 30. 7, with its skull 1758 a, as a lectotype of *R. (Rhinoxax) chrysopygus*, the other two co-types mentioned by the author thus becoming lecto-paratypes.

#### XLIV.—*A new Wild Dog from the Bogotá Cordillera.*

By OLDFIELD THOMAS.

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THE British Museum owes to the Rev. Prof. Apollinaris Maria, of the Faculty of Medicine, Bogotá, an example of a wild dog from the eastern slopes of the Bogotá Cordillera, and this appears to me to represent a species not hitherto described.

It may be called

*Cerdocyon apollinaris*, sp. n.

A small stoutly built *Cerdocyon*, with very robust teeth.

External characters much as in *C. thous*. General colour above coarsely grizzled black and white, with a suffusion of buffy. Sides dull buffy. Belly buffy whitish. Back of ears little darker than head, their inner surface and edges, and a large patch behind them buffy. Lips and chin black. A white patch on throat. Limbs buffy, greyish externally, clearer buffy internally; hands and feet black, more or less grizzled proximally. Tail with the usual dorsal and terminal black-tipped hairs.

Skull short but very stoutly built; its length slightly exceeding that of *C. aquilus*, Bangs, of Santa Marta, less than that of the Brazilian *C. brasiliensis*, Schinz. Muzzle proportionally short and broad, the combined transverse breadth of the incisors unusually great.

Teeth stout and heavy throughout. Canines thick. Premolars broad. Carnassial and molars large, and so rounded as to give them an unusually large area, even as compared with forms in which direct measurements make the teeth appear larger—e. g., *C. mimax*. Space between  $m^1$  and  $m^2$  reduced to a narrow crack.

Dimensions of the type:—

Tail (measured on skin, vertebræ extracted) 240 mm.; hind foot (wet) 131; ear (wet)  $71 \times 54$ .

Skull: greatest length 135; condylo-basal length 132; zygomatic breadth 79; nasals 49; breadth of muzzle at  $p^1$  24; interorbital breadth 27; tip to tip of postorbital processes 42; intertemporal breadth 33; breadth of brain-case 48.5; palatal length 67.

*Teeth*.—Transverse length of upper incisor-row 18.7. Diameter of canine on cingulum 6.6. Length of  $p^1$  4.6,  $p^2$  7.2,  $p^3$  7.4,  $p^4$  on outer edge 13.6; diagonally 15.  $M^1$ , length on outer edge 10.9, middle breadth 11.8, greatest diagonal breadth 14.  $M^2$ , length on outer edge 6.7, greatest diagonal breadth 10. Length of  $p_1$  4.5,  $p_2$  6.8,  $p_3$  8.2,  $p_4$  8.8,  $m_1$  15.5,  $m_2$  9,  $m_3$  4.7.

*Hab.* (of type). Choachi, eastern slope of Cordillera, Bogotá. Alt. 1800 m.

*Type*. Adult male. B.M. no. 18. 3. 28. 1.

This wild dog differs markedly from all its allies by its short stoutly built skull and remarkably heavy teeth. I have much pleasure in connecting with it the name of the enthusiastic naturalist to whom we owe its discovery.

XLV.—*Remarks on the Batrachian Genera Cornufer, Tschudi, Platymantis, Gthr., Simomantis, g. n., and Staurois, Cope.*  
By G. A. BOULENGER, F.R.S.

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IN the March number of these 'Annals' I have pointed out some differences in the structure of the terminal discs of the digits in the genus *Rana*, and endeavoured by their application to the Papuan and Melanesian species to ensure a clearer definition of these frogs and a grouping more in accordance with their natural affinities. In proposing the subgenus *Discodeles* for certain Indian and Melanesian frogs, the true relationships of which I had failed to grasp before, I stated that it leads to *Cornufer*, a genus previously defined as differing from *Rana* in the free or very feebly webbed toes and the complete union of the outer metatarsals by the thickened integument, the web not penetrating between them. In view of the state of things in the species grouped under *Discodeles*, the definition is no longer sufficient, and I have had to consider whether *Cornufer* should be treated as a mere subgenus of *Rana*, or whether other characters, justifying a generic separation, could be discovered.

I have come to the conclusion, after examining a large material, that, although unquestionably connected with *Discodeles*, these frogs can be sharply separated from *Rana* by reverting to the view of Günther (1858), that the species with large digital discs (*Cornufer*, Tschudi, = *Halophilus*, Girard) should be kept distinct from those with small discs and practically free toes (*Platymantis*, Gthr.).

The discs of *Platymantis* do not differ from those of *Rana bufo* *uniformis*, *opisthedon*, and *guppyi*, from which group the genus may be derived, whilst those of *Cornufer*, though agreeing in shape with those of *Rana beddomii* and its Indian allies, present this notable feature, that a transverse groove, extending across the lower surface and corresponding in position with the horizontal limb of the T-shaped terminal phalanx, is continuous with the crescentic or horseshoe-shaped groove between the upper and the lower surface, thus defining a hemispherical area within the disc, a feature which is foreshadowed in the species of *Rana* (subgenus *Ilylorana*) separated by Cope under the name of *Amolops*, in which a more or less distinct transverse ridge or groove also corresponds to the very long horizontal limb of the terminal phalanx without actually joining the marginal groove. There is, I feel sure, no direct genetic connection between these frogs and *Cornufer*, as proved by the osteological characters

of the latter, which agree with those of *Discodeles* (large nasals in contact with the frontoparietals, omosternal style forked at the base) and differ from those of *Amolops* and *Staurois* (small nasals widely separated from each other and from the frontoparietals, omosternal style not forked).

Digital discs absolutely similar to those of *Cornufer* are found in *Staurois*, Cope (type: *Ixalus natator*, Gthr.), and in a frog from Kina Balu, North Borneo, described by me thirty years ago under the name of *Ixalus latopalmatus*, which I now regard as the type of a new genus, *Simomantis*, so named in allusion to the curious pug-like form of the snout; this frog agrees with the species grouped under *Staurois* in the very large digital discs, broader than long, supported by T-shaped phalanges in which the horizontal limb is longer than the longitudinal, in the absence of an intercalated bone between the penultimate and distal phalanges, in the outer metatarsals separated to the base by the very broad web of the toes, in the absence of vomerine teeth, and in the osteological characters referred to above. In addition to the structure of the digital discs, *Simomantis* is distinguished from *Rana*, as it is also from *Staurois*, by the webbed fingers, a character which had led me to refer *S. latopalmata* to the vicinity of *Ixalus bimaculatus*, Peters, likewise from Borneo, which is, however, a true *Ixalus*.

*Simomantis* is confined to Borneo; *Cornufer* is known from Burma (*C. tenasserimensis*, Stoliczka, originally described as a *Rana*), Borneo (*C. baluensis*, Blgr. = *Rana sariba*, Shelford), the Philippines (*C. guentheri*, Blgr., *jagorii*, Peters, *worcesteri*, Stejneger, *corrugatus*, A. Dum.), New Guinea (*C. unicolor*, Tschudi), the Solomon Islands (*C. guppyi*, Blgr.), and the Fiji Islands (*C. dorsalis*, A. Dum., *intermedius*, F. Müll.); whilst *Platymantis* is represented in the Philippines (*P. corrugata*, A. Dum., *meyeri*, Gthr.), New Guinea and neighbouring islands (*P. corrugata*, A. Dum., *punctata*, Peters & Doria, *beauforti*, v. Kamp.), New Britain (*P. boulengeri*, Boettg.), the Solomon Islands (*P. solomonis*, Blgr.), and the Fiji Islands (*P. vitiana*, A. Dum., *unilineata*, Peters).

Although the presence or absence of vomerine teeth is generally regarded as of generic importance, it would be so obvious a violation of the principles of natural classification to separate generically *Staurois hainanensis*, Blgr., from *Rana latopalmata*, Blgr. (*Amolops afghana*, Cope), or *Staurois natator*, Gthr., from *Rana guttata*, Gthr., on this ground, that I have no hesitation in referring *Staurois hainanensis* to *Rana*, in spite of the absence of vomerine teeth, and in modifying the definition of the genus *Staurois*, founded on the absence

of these teeth, so as to include *Rana guttata*, in which they are present though feebly developed. I have formerly even gone so far as to regard the last as specifically identical with *Staurois natator*; now, with a larger material for study, I find it advisable to distinguish them and also to recognize the species described by Mocquard as *Ixalus nubilus*. *Rana larutensis*, Blgr., shows the same digital structure as the last-named species, and is therefore removed from *Rana* and referred to the same genus.

Five species constitute the genus *Staurois* as now defined, agreeing in the small tympanum; in the very large discs of the fingers, broader than long and larger than those of the toes, with a half-disc within the disc on the lower surface; in the very full web of the toes, involving the base of the discs; and in the outer metatarsals separated to the base. They may be distinguished as follows:—

- I. Head as long as broad, much depressed; no papilla in the middle of the tongue; vomerine teeth in small groups just behind level of choanæ; tibio-tarsal articulation reaching tip of snout or beyond; tibia 4 to  $4\frac{1}{2}$  times as long as broad. *S. larutensis*, Blgr. (Malay Peninsula and Borneo).

II. Head longer than broad, moderately depressed.

- A. No papilla in the middle of the tongue; tibio-tarsal articulation reaching tip of snout or beyond; tibia 5 to 7 times as long as broad; skin of upper parts coarsely granulate.

Vomerine teeth in small groups between

the choanæ ..... *S. guttatus*, Gthr. (Borneo).

No vomerine teeth ..... *S. natator*, Gthr. (Philippines).

- B. A conical or rounded large papilla in the middle of the anterior third of the tongue; no vomerine teeth.

Tibio-tarsal articulation reaching tip of snout or beyond; tibia 5 to 6 times as long as broad; skin of upper parts coarsely granulate .....

*S. nubilus*, Mocquard (Palawan).

Tibio-tarsal articulation reaching between eye and nostril; tibia 4 to  $4\frac{1}{2}$  times as long as broad; skin of upper parts feebly granulate .....

*S. tuberilinguis*, sp. n. [(Borneo).]

The eggs, which measure  $1\frac{1}{2}$  mm. in diameter, are strongly pigmented, dark brown over the greater part of the surface, in *S. guttatus*, feebly pigmented, pale brown, in *S. nubilus*, unpigmented in *S. natator*; they are also unpigmented, but larger (2 mm.), in *S. larutensis*.

I append a description of the new species:—

*Staurois tuberilinguis*.

Vomerine teeth absent. A large conical papilla in the



middle of the anterior third of the tongue. Head longer than broad, moderately depressed; snout obtusely pointed, strongly projecting beyond the mouth, as long as the eye; canthus rostralis sharp; loreal region feebly oblique, deeply concave; nostril a little nearer the tip of the snout than the eye; interorbital space as broad as or a little broader than the upper eyelid; tympanum moderately distinct, not quite  $\frac{1}{2}$  the diameter of the eye. Fingers rather slender, the tips dilated into very large discs which are broader than long; first finger longer than the second; subarticular tubercles small, feebly prominent. Toes rather short, the fourth not much longer than the fifth, with discs similar to those of the fingers but smaller, fully webbed, the web feebly notched and involving the base of the discs; no tarsal fold; inner metatarsal tubercle oval, flat,  $\frac{1}{3}$  the length of the inner toe; no outer tubercle. Tibio-tarsal articulation reaching between the eye and the nostril; tibia 4 to  $4\frac{1}{2}$  times as long as broad, twice, or slightly less than twice, in length from snout to vent, shorter than the fore limb, longer than the foot. Skin feebly granulate above, with flat glandules on the sides, of belly smooth or feebly granulate. Dark brown above and on the sides, including the upper lip, with a few very indistinct lighter vermicular markings on the head and back; limbs without or with rather ill-defined dark cross-bands; hinder side of thighs dark brown, with small yellow spots or vermicular markings; web between the toes blackish; lower parts white, throat brown or spotted with brown.

From snout to vent 42 mm.

This species is proposed for two female specimens, the larger from Mt. Kina Balu, North Borneo, altitude 4200 feet, received from Dr. R. Hanitsch in 1899, the smaller from Mt. Batu Song, Sarawak, 1000 feet, received from Dr. C. Hose in 1892.

XLVI.—*Further Notes on some External Characters of the Bears* (Ursidæ). By R. I. Pocock, F.R.S.

*Introduction.*

In 1914 (Proc. Zool. Soc. pp. 929–941) I described the feet and rhinaria of certain species of Ursidæ, and on the strength of the characters observed admitted the following genera of this family: *Melursus* for *ursinus*, *Helarctos* for *malayanus*, *Tremarctos* for *thibetanus* and *ornatus*, *Ursus* for *arctos*, *horribilis*, *americanus*, and their allies, and *Thalarctos* for

*maritimus*. The material examined consisted of a newly born cub of *Thalarctos maritimus* and of *Ursus arctos* and adult examples of *Melursus ursinus*, *Tremarctos thibetanus*, and of *Ursus americanus*, the conclusions regarding *Helarctos malayanus* being derived from an inspection of living specimens and dried skins. Since that date I have had the opportunity of examining in the Prosectorium of the Zoological Society fresh dead specimens of *Ursus horribilis* and of *Helarctos malayanus*, thus adding two species to my previous list, and also of *Melursus ursinus*, *Tremarctos thibetanus*, and of *Ursus americanus*, and an adult of *Ursus arctos* from North Russia, enabling me to confirm and extend my previous observations on these species. With regard to *Thalarctos* I can add nothing to what I previously stated.

The examples of *Ursus horribilis*, two females 25 and 27 years old respectively, from the Missouri Brakes, Montana, whence they were brought as cubs in 1890 by Mr. Ewen Cameron, cause me to modify considerably my conception of the genus *Ursus*. The feet, indeed, as explained below, differ so markedly from those of *Ursus americanus* that I am persuaded the two bears should be separated generically or subgenerically, unless other examples of *U. horribilis* show the characters to be variable, a conclusion not justified by the analogy of other Carnivora. In certain respects the feet of *Ursus arctos* bridge the interval between those of *U. horribilis* and *U. americanus*. But, curiously enough, *U. arctos* is in this character nearer *U. americanus* than *U. horribilis*, which was hardly to be expected from the external appearance of the species concerned.

It may be recalled that Gray long ago gave superspecific rank to these bears, applying the name *Danis* to *horribilis*, *Euarctos* to *americanus*, and reserving the name *Ursus* for *arctos* and its near allies. In the following pages the species are recorded under those names.

In 1917 (Ann. & Mag. Nat. Hist. ser. 8, vol. xx. p. 129) I severed *thibetanus* from *Tremarctos* as a distinct genus *Arcticonus*, based upon the cranial differences between the Asiatic and South American forms. Hence it follows that each of the well-marked types of living Bears takes generic or subgeneric instead of specific rank, a conclusion which many will deprecate, but which is more in accord with modern schismatic treatment than the older conception.

The existing genera and typical species of Ursidae will therefore stand as follows:—*Thalarctos maritimus*, *Ursus arctos*, *Danis horribilis*, *Euarctos americanus*, *Arcticonus thibetanus*, *Helarctos malayanus*, *Melursus ursinus*, *Tremarctos ornatus*. Whether the various forms of *Ursus*, *Danis*,

*Euarctos*, *Arcticonus*, *Helarctos*, and *Tremarctos* should rank as species or subspecies is a matter about which there will probably be no unanimity for many years to come\*.

In my previous paper upon the bears, only the rhinarium and feet were discussed. In the present instance I have added a few notes on the ears.

### The Ears.

I have not examined the ears in *Thalarctos*, *Arcticonus*, *Melursus*, and *Tremarctos*, but, judging from their size in these genera, it may be assumed provisionally that they resemble the ears of *Ursus*, *Danis*, and *Euarctos*. Taking the ears of these three forms as typical, it may be said that in all bears, except *Helarctos*, the ears are expanded and flattened distally, with convex margin, and tubular proximally, the angular junction of the tragal and antitragal edges reaching nearly as high as the low-set supratragus, and the external meatus lying deep at the bottom of the tube. There is no trace of the bursa, an invariable feature in the Canidae and Felidae.

The supratragus (*plica principalis*) is a strong ridge overlapped anteriorly by the antero-internal ridge and provided towards its posterior end with a conspicuous knob-like thickening. The tragus and antitragus are small elevations separated by a shallow, narrow notch. The antero-external ridge above the tragus is weak but the antero-internal is strong and prominent where it overlaps the supratragus. The two posterior ridges are likewise moderately strong, the greater part of the external lying deep in the tubular hollow below the point of junction of the two rims externally †.

The ear of *Helarctos malayanus* (fig. 1, C) is much shorter and narrower and simpler than in the three above-mentioned species. The upper portion of the pinna is considerably less expanded and less rigid and its height from the supratragus to the summit is less than its total width, despite its narrowness. All the ridges are soft, not rigid, the tragus, the antitragus, and the anterior and posterior ridges are

\* In 1896 Merriam (Proc. Biol. Soc. Wash. x. pp. 65-83) admitted *Euarctos*, comprising three species, as a subgenus of *Ursus*. The rest of the North American bears, excluding *Thalarctos*, he referred to *Ursus*, *sensu stricto*, recognising two species of the grizzly bear type and three of the brown bear type.

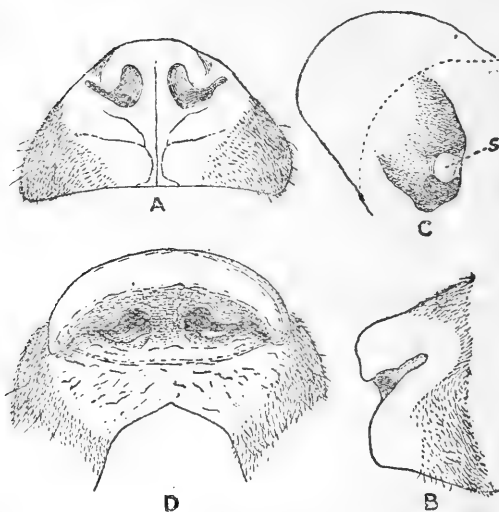
† The ears of *Melursus ursinus* and of *Helarctos malayanus* have been described by Boas (Die Ohrknorpel, etc., p. 136, 1912); but the figure of the ear of *M. ursinus* is not helpful from my present standpoint.

obsolete and the supratragus alone retains its normal size and shape.

### *The Rhinarium.*

In profile view the rhinarium of *Danis horribilis* resembles that of *Euarctos americanus*, as figured by me in 1914, the septum of the nares visibly projecting beyond their lateral boundaries. From the anterior view also the rhinaria of the two species are much alike, except that in *D. horribilis* the

Fig. 1.



- A. Rhinarium and upper lip of *Helarctos malayanus* from the front.  
 B. The same from the side.  
 C. Right ear of *Helarctos malayanus*, flattened. s. supratragus; the dotted line indicates the line of attachment of the pinna to the head.  
 D. Rhinarium and upper lip of *Melursus ursinus* from the front.

rhinarium is relatively a little wider, forming a disk about as wide as high, with the summit mesially depressed and the nares themselves more expanded laterally. Moreover, the median area of the upper lip below the rhinarium is scantily hairy. The rhinarium, however, is everywhere sharply circumscribed.

The rhinarium of the example of *Ursus arctos* generally resembles that of *Danis*, but the nostrils are a little smaller, the septum a little wider, and the infranarial portion less sharply defined from the tip towards the middle line, and the

lip itself showed hardly any vertical groove. These differences may be merely individual.

My figure of the rhinarium of *Helarctos malayanus*, published in 1914, was taken from a dried skin and very imperfect. In the fresh specimen examined, the rhinarium (fig. 1, A, B) from the front resembles in a general way that of *Danis horribilis*, *Euarctos americanus*, and *Arcticonus thibetanus*; but in profile view the lateral boundaries of the nares project beyond and conceal the septum as in *Melursus*. The skin round the disk is naked both dorsally, laterally, and inferiorly, and the rhinarium itself is nowhere sharply circumscribed, and the upper lip is more prominent and mobile than in ordinary bears, though less so than in *Melursus*.

The most noticable characters in the rhinarium of *Melursus ursinus* are its great width as compared with its height, the transverse elongation of the nares, and the extent to which the nares are overlapped above and sideways by the upper rim and lateral lobes. The infranarial portion of the rhinarium is very shallow, indistinctly defined from the subjacent area of the upper lip which is to all intents and purposes naked, generally moist, and shows no trace of the median divisional line apparent in other bears, even in *Helarctos malayanus*. The structure of the rhinarium in *Melursus* suggests that the nostrils are capable of being closed by compression from above downwards (fig. 1, D).

#### The Feet.

My brief account of the feet of *Euarctos americanus* may be repeated and amplified.

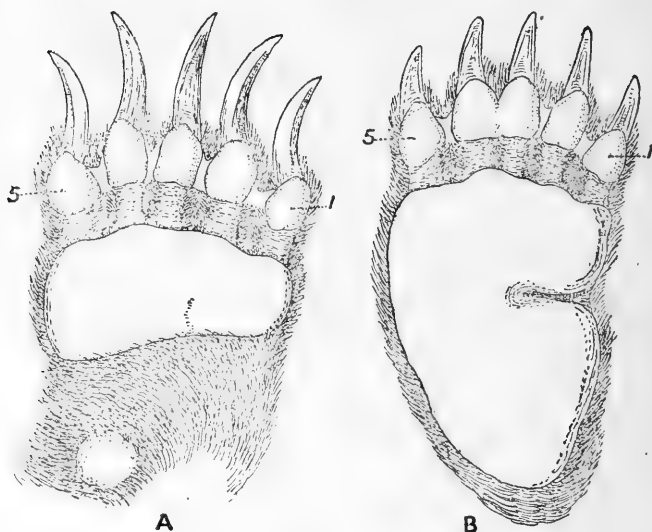
The digital pads of the fore foot are separated almost to their proximal ends, where they are united by a narrow strip of naked skin. They are susceptible of considerable divarication, expanding the paw distally. When in contact they form a relatively strongly curved line, the third and fourth toes projecting beyond the second and fifth, and the first lying considerably farther back and well behind the second. The area between the digital pads and the plantar pad is overgrown with hairs arranged in four patches on the interdigital webs, the middle line of each digit exhibiting a narrow hairless tract. The plantar pad appears to vary in shape and in its length with relation to its width\*; but in all

\* In my figure of the fore paw of a specimen from Newfoundland this pad is wider as compared with its length than in examples from Ontario subsequently examined; but whether this variation and the more distal placing of the pollical pad, as well as others observable in the hind foot of the Newfoundland specimen, are seasonal, local, individual, or due to inaccuracy of drawing, I am not in position to say.

cases the area behind it is overgrown with hairs from which the carpal pad arises, as an island, towards the outer or ulnar side of the wrist.

The hind foot, so far as the digital pads are concerned, agrees, broadly speaking, with the fore foot. The whole foot is actually longer and narrower than the fore foot; and the plantar pad is partially divided in two by a deep angular depression, covered with hair, which penetrates it on the inner or hallucal side. The part of the pad behind this hairy depression does not extend nearly to the tip of the heel, the extent of the heel which is covered with hair being

Fig. 2.



A. Right fore foot of *Danis horribilis* from below.

B. Right hind foot of the same. 1, the first digit; 5, the fifth digit.  
(The hairs are everywhere cut short.)

almost equal to the length of the anterior half of the plantar pad along the middle line\*.

In the fore foot of *Danis horribilis* (fig. 2, A) the digital pads are tightly tied together by naked integument extending approximately to the middle of their length, the integument

\* At least in the Ontario specimens. In my figure of the hind foot of the Newfoundland specimen the heel appears to be much shorter; but the approximate equality in length between this foot and the fore foot of the same specimen convinces me that the precise length of the heel was disregarded in the illustration.

advancing a little further between the second, third, and fourth toes than between the first and second and the fourth and fifth. These pads, therefore, are susceptible of comparatively slight divarication. Moreover, the line of these pads is only lightly and tolerably evenly curved, the pad of first digit (pollex) lying alongside that of the second. It is noticeable that the strip of integument joining these two pads is a little wider than the others. In other respects the fore foot conforms to the type of *Euarctos americanus*, except that the hairy space between the digital and plantar pads is much shorter\*.

The hind foot (fig. 2, B) with respect to the digital pads differs similarly from that of *Euarctos*, with the additional difference that these pads on the third and fourth digits are themselves immovably fused together along the proximal half of their juxtaposed edges and cannot be separated at all. The plantar pad covers the sole of the foot almost as far back as the tip of the heel, a relatively small portion of the latter being covered with hair; and the divisional depression passing inwards from the hallucal margin is both shorter and narrower than in *Euarctos*, and is, moreover, hairless.

Finally, in both the fore and hind feet the pads are much more coarsely papillate than in *Euarctos*.

In the analytical table of the external characters by which the genera of bears appeared to be distinguishable (P. Z. S. 1914, p. 940), I stated that the digital pads of the brown bear and of the grizzly bear are separated throughout their length. This was a double error, due to an examination of dried skins, to the necessarily superficial inspection of the feet of living examples, and, in the case of *U. arctos*, to my having only a newly-born cub, preserved in alcohol, in my hands.

In an adult example of *U. arctos*, from North Russia, the feet generally conform to those of *Danis horribilis*, but they differ in two particulars. The digital pads, although united by webbing to approximately the same extent, are susceptible of being more widely divaricated owing to the greater width of the web. This applies both to the fore and hind foot. Moreover, in *U. arctos* the pads of the third and fourth digits of the hind foot are not immovably fused together throughout the greater part of their length, but are quite free, although not to precisely the same extent as the third is from the second and the fourth from the fifth. The

\* A feature possibly attributable to my inability to straighten the digits, owing to the previous immersion in alcohol of the feet of *D. horribilis*.

differences between the hind feet of *Danis* and *Ursus* may be seen by comparing my sketch of the right foot of the former with that of the latter, published by Boas in 1909 (Zool. Anz. xxxiv. p. 529). This figure shows the digits of *U. arctos* in their natural position and not separated to their full extent as in my figure of the feet of *D. horribilis*. Also in Boas's figure it may be noted that the pad of the first digit is set farther back, a much greater extent of the heel is covered with hair, and that the transverse groove on the inner half of the sole is larger and invaded by hair. This character, however, is variable in *U. arctos*.

A point of special interest connected with the feet of *Danis horribilis* is their resemblance in the alignment and fusion of the digital pads to the feet of *Melursus ursinus*. In the latter, however, all the digital pads are united to the same, or nearly the same, extent\* as are those of the third and fourth digits of the hind foot in *D. horribilis*, and the posterior border of the pads is less well defined and the area between them and the plantar pad is quite naked. Similarly, in the fore foot of *Melursus* the area between the plantar pad and the carpal pad is naked, and above the carpal pad the integument is for a short distance quite scantily clothed with hair. Nevertheless, the structure of the feet of *Melursus* suggests that this genus is a specialized modification of the *Danis*-type rather than of the *Arcticonus thibetanus* or *Helarctos malayanus*-type, the hemispherical ulnar carpal pad and reduced radial carpal pad recalling these structures in *Danis*, *Ursus*, and *Euarctos*.

In *Helarctos malayanus*, as I have already stated from an examination of living specimens and dried skins, the feet resemble tolerably closely those of *Arcticonus thibetanus*. This I have been able to verify on a fresh specimen from British North Borneo. The digital pads are free and susceptible of wide divarication as in *Euarctos*, but when in contact their alignment is not quite so strongly curved as in that genus. The hair clothing the area between the digital and plantar pads is reduced to four patches opposite the interdigital spaces, and these patches are much larger on fore than on the hind feet and the anterior border of the plantar pad is less well defined than in *Euarctos*. In the fore foot the carpal pad forms an area as wide as the plantar pad and continuous with it, as in *Arcticonus thibetanus*, but the divisional line between the two is much less emphasised than in the specimen of that species I figured in 1914. In

\* The degree of fusion varies within the genus, the sutural line sometimes being distinctly retained, sometimes almost obliterated as in my original figure.



the hind foot the sole, as in *Arcticonus thibetanus*, but not in *Euarctos*, shows no deep inrunning depression on the hallucal side and the hairy area of the heel is comparatively short as in *Arcticonus*.

The genera above enumerated may be defined by the following combination of external characters:—

Genus *MELURSUS*, Meyer.

Rhinarium transversely elongate, without median groove, and not traceable to edge of upper lip, which is smooth beneath the rhinarium, the margin of the latter overlapping the valvular nostrils above and laterally. Lips and tongue long and highly protrusible. Ears large. Feet with fused digital pads and area between these pads and the plantar pad hairless; carpal area of fore feet naked, but with radial pad forming a rounded eminence as in *Ursus*, and ulnar pad also defined, though indistinctly; groove on plantar pad of hind foot deep and moderately long.

Type and only species, *M. ursinus*.

Genus *HELARCTOS*, Horsfield.

Rhinarium not transversely elongated, with median groove traceable to lower edge of upper lip, which is smooth beneath the rhinarium, the latter laterally overlapping the septum between the expanded portion of the nostrils. Lips and tongue less protrusible than in *Melursus*, more so than in the succeeding genera (? *Tremarctos*). Ears very small, with supporting ridges, apart from the supratragus, obsolete. Feet with free digital pads and area between them and the plantar pad with four interdigital mats of short hair; carpal area covered by a continuous large pad separated from the plantar pad by a comparatively narrow crease; groove on plantar pad of hind foot short and shallow.

Type, *H. malayanus*. Number of species or subspecies doubtful.

Genus *ARCTICONUS*, Pocock.

Rhinarium at least differing from that of *Helarctos* in that the lateral lobes do not overlap the expanded portion of the nostrils, which are thus exposed in profile view. Upper lip less protrusible and hairy beneath the rhinarium up to the median vertical groove. Ears large, expanded, with well-defined ridges. Feet of the same type as in *Helarctos*, but with the groove between the plantar and carpal areas better defined and the hairs of the interdigital mats longer.

Type, *A. thibetanus*. Number of species and subspecies doubtful.

## GENUS TREMARCTOS, Gervais.

External characters known to me only from dried skins, but apparently resembling those of *Arcticonus*, although the examination of fresh material will probably reveal some differences in the feet and other organs. Pending this the two genera may be distinguished by the skull-characters I pointed out in 1917.

Type, *T. ornatus*. One or two species.

## GENUS EUARCTOS, Gray.

Rhinarium, lips, and ears apparently essentially as in *Arcticonus*, but the ears smaller. Feet differing from those of *Arcticonus* in that the carpal area is thickly covered with hair, from which the ulnar carpal pad arises as a hemispherical excrescence towards the inner side of the wrist, and the groove on the plantar pad of the hind foot is much deeper, wider, and longer, and filled with hair spreading inwards from the margin of the sole.

Type, *Eu. americanus*. A few species.

## GENUS URSUS, Linn.

Approximately resembling *Euarctos* in external characters, except that the digital pads are united by membrane in the basal half of their length, although capable of considerable separation. Further distinguishable from *Euarctos* by the cranial features described by Merriam in 1896.

Type, *U. arctos*. Probably a few species, certainly many subspecies.

## GENUS DANIS, Gray.

In external features agreeing with *Ursus*, but with the pads of the third and fourth digits of the hind foot completely fused in the basal half and inseparable, and all the rest of the digital pads united by much narrower webbing, so that the digits themselves are susceptible of very slight divarication.

Type, *D. horribilis*. Two species, possibly more.

## GENUS THALARCTOS, Gray.

Rhinarium, lips, and ears, so far as it is permissible to guess, resembling those of *Ursus* and *Euarctos*, and the feet conforming to the same general type as in those genera\*, but the soles much more overgrown with hair enormously reducing the size of the plantar pads, the pad behind the plantar pad of the hind foot represented by a small elongated piriform pad towards the inner side of the foot about halfway between the plantar pad and the heel.

Type, *Th. maritimus*. Only one species admitted.

\* In newly-born cubs the digital pads are not united.

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## CONTENTS OF NUMBER 5.—*Ninth Series.*

	Page
XL. Notes on Exotic <i>Chloropidae</i> .—Part II. <i>Osciniinae</i> . By C. G. LAMB, M.A., B.Sc., Clare College, Cambridge .....	329
XLI. Notes on Fossorial Hymenoptera.—XXXIV. On Ethiopian <i>Psammocharidae</i> in the British Museum. By ROWLAND E. TURNER, F.Z.S., F.E.S. ....	349
XLII. Notes on Fossorial Hymenoptera.—XXXV. On new <i>Sphecoidea</i> in the British Museum. By ROWLAND E. TURNER, F.Z.S., F.E.S. ....	356
XLIII. Notes on <i>Petrodromus</i> and <i>Rhynchocyon</i> . By OLDFIELD THOMAS .....	364
XLIV. A new Wild Dog from the Bogotá Cordillera. By OLDFIELD THOMAS .....	370
XLV. Remarks on the Batrachian Genera <i>Cornufer</i> , Tschudi, <i>Platymantis</i> , Gthr., <i>Simomantis</i> , g. n., and <i>Staurois</i> , Cope. By G. A. BOULENGER, F.R.S. ....	372
XLVI. Further Notes on some External Characters of the Bears ( <i>Ursidae</i> ). By R. I. Pocock, F.R.S. ....	375

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XLVII.—*Notes on Exotic Chloropidæ*.—Part II. Oscininæ.  
By C. G. LAMB, M.A., B.Sc., Clare College, Cambridge.

[Concluded from p. 348.]

ELACHIPTERA, Macq.

*E. simplicipes*, Beck.

S. RHODESIA: Salisbury (*G. A. K. Marshall*, Camb. Coll.).

*E. conjuncta*, Adams.

In the Camb. Coll. is a long series of an *Elachiptera* from various parts of South Africa. It has the remarkable form of abdomen in which the basal segments are fused and much elongated, the end segments being often almost entirely drawn up inside the previous one; the scutellum has one main pair of tubercles and a smaller side pair; the arista is shaped like a sword-bayonet. The amount of blackening varies very greatly with the locality. In the Chirinda Forest the prevalent type is one in which the dorsum is all shining black, the pleura red, the scutellum more or less blackened basally and discally; in one specimen the thorax is all orange, with an entirely black scutellum. Near Durban the

prevailing type has the blackening confined to the two side-rows of pits on the dorsum and the scutellum is much paler; in a few cases the dorsum is more generally suffused, though not all black, or the dorsum is entirely darkish orange. A single specimen from near Durban is even quite clear orange and is larger than the others.

In all the forms the elongate abdominal segments vary in colour; the normal type is orange in the centre, with a black border, but this varies much till it may nearly cover the whole surface. The legs are orange, but in some cases the front tibia and in others the last tarsal joints are a little darkened. There is also a barely perceptible variation in the slope of the hind cross-vein, which is most marked in the large pale specimen.

It appears that we have here a single variable species. Although Adams (Kansas Univ. Sc. Bull. iii. 1905, p. 190) omits to mention the arisal form, there can be little doubt that the whole series is best placed in his species, of which he had but two specimens. The larger single specimen can be taken to be Becker's *E. occipitalis*; in fact, Becker is of the opinion that this is merely a pale variety of Adams's species.

NATAL: Durban (*F. Muir*); S. RHODESIA: Chirinda Forest (*G. A. K. Marshall*).

*Elachiptera dubia*, sp. n.

There are several specimens of a species of the *cornuta* group, which may be a light form of *E. sibirica*, Lw., which species Becker records from Africa. It does not absolutely agree with Becker's description, and hence a brief account of it is appended.

The thoracic colour is darkened orange, not black, though some specimens are more dusky than others. The puncture-lines are less marked than in *cornuta*, largely owing to the much smaller size of the diverging furrow-bristles; the scutellum is more finely punctate, the end tubercles being a little larger, the side ones about the same; the head is very like that of *cornuta*, but the triangle is perceptibly smaller, the thickened arista slightly longer, and the hairing of it considerably denser. The legs are entirely yellow, with the last tarsal joints sometimes a little suffused; the hind tibia has a well-marked "brand" outside.

The pleura is all red right up to the edge of the dorsum.

The insect is of about the same size as *E. cornuta*.

NATAL: Durban (*F. Muir*, Camb. Coll.).



## MELANOCHÆTA, Beck.

*M. pubescens*, Thalh.

There is a long range of specimens from Durban (*F. Muir*) and a few from the Chirinda Forest, Mashonaland, which cannot be separated from this cosmopolitan species, although there is a certain amount of variation in the intensity and extent of the dark suffusions.

*M. flavofrontata*, Beck.

There are three specimens that agree with the description of this species, even in the presence of the small femoral spot (see III. p. 165). They are a light form, and the rows of punctures are very nearly obsolete, as is the case in many specimens of *M. pubescens*. It is just possible they are specifically distinct from Becker's species.

S. INDIA: Yerkand, Shevaroy Hills, 4500 ft.

## HIPPELATES, Loew.

*H. longiseta*, Lamb.

This species was first described by the author from the Seychelles (Proc. Linn. Soc., Zool. xv. pt. 3, p. 334). There are specimens in the Camb. Coll. from Mozambique (*F. Muir*).

*H. nigricornis*, Thoms., var. *bilineata*, Meij.

CEYLON: Peradeniya (*A. Rutherford*).

*H. minor*, Meij.?

There are a few specimens which are probably a light form of this species. According to the description, it has two thoracic lines merging into a big spot. These specimens have a large black thoracic spot just before the scutellum, but practically no sign of the lines. They possess all the other characters, including the peculiar mesopleural spot and the non-terminal tibial spur. In the absence of more material, and bearing in mind the considerable colour variation that occurs in species of this genus, there is no valid reason for separating the specimens under another name.

CEYLON: Peradeniya (*A. Rutherford*).

*Hippelates ocellata*, sp. n.

Two specimens are present which must be near *mesopleuralis*, Beck.

Head (top view):—Frons orange, the triangle shining, equilateral, the base being about  $\frac{4}{5}$  the breadth of the head at vertex and the point extending about  $\frac{4}{5}$  down to the front; eyes considerably more densely pilose than in most of the pubescent-eyed species. Side-view: antennæ orange, with black and very pubescent arista inserted just supra-apically; jowls at their narrowest about  $\frac{1}{5}$  depth of 3rd joint, these and the face whitish and slightly silvery; hind head orange, slightly darkened around the neck; palpi orange.

Thorax: dorsum orange, the humeri lighter; just behind each is a perfectly circular black spot; a long, somewhat oval-ended black spot starts just beyond the middle of the dorsum and extends nearly to the scutellar insertion; the scutellum is orange, with two long terminal and shorter side-bristles; in one specimen the central thoracic spot extends over the scutellum, in the other the disc is barely darkened. Pleura shining orange; the notopleura is blackened just over wing-base; the mesopleura is all very shining black, the metanotum dark shining orange.

Wings quite normal, clear, with brown veins. Halteres all orange.

Legs all orange, except that the front tibia and tarsus are infusate, as is most of the hind tibia; the spine on the latter is inserted before the end and its tip extends to just beyond the articulation of the tibia and tarsus.

Abdomen black and rather shining, the central area of 1st and 2nd segments orange.

Size, excluding antenna, 2 mm.

CEYLON: Peradeniya (*A. Rutherford*).

## LASIOPLEURA, Beck.

The occurrence of this aberrant European genus in Ceylon is of interest. The genus is remarkable in possessing an almost complete Acalyptrate type of chaetotaxy, including a full complement of d.-c. and acrostichal bristles.

*Lasiopleura zeylanica*, sp. n.

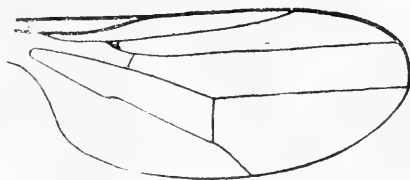
The chaetotaxy is practically as given by Becker (I. p. 131), and will not be further indicated.

Head (top view):—Frons very bright clear orange, the side-forks (between eyes and triangle) brown; the triangle is very shining black, with its base across the whole vertex, slightly concave sides, and its extreme tip yellow and extending somewhat indistinctly almost to the front; there are a few scattered black hairs on the frons. Face nearly white. Side-view: eye-margins and jowls pale orange, somewhat suffused with silvery dust, the depth of jowl about equal to 3rd joint; fine pale vibrissa about halfway down the curved profile, followed by tiny hairs; antenna orange, with a black spot at insertion of the black, distinctly pubescent arista; second joint with a long dorsal bristle at tip; palpi pale yellow; tongue long, thickening towards the end, shining black. Hind head dullish black.

Thorax: dorsum absolutely smooth, black, uniformly though thinly covered with golden brown pollen, all bristles black, well developed, and long, especially the last d.-c. Scutellum as thorax, nearly semicircular in profile, very long terminal bristles and quite short side ones; pleura as dorsum, but less shining.

Wings (fig. 20) long, infusate, especially so in some cases on the costal half. Halteres yellow.

Fig. 20.

*Lasiopleura zeylanica*,  $\times 22$ 

Legs long, all yellow, but generally slightly suffused on the tibiæ and tarsi.

Abdomen rather shining black, with longish black hairs, especially long on the sides.

Size  $2\frac{1}{2}$  mm., wings a little more.

CEYLON: Peradeniya (*A. Rutherford*).

## GAMPSOCERA, Schin.

*Gampsocera mutata*, var. *grandis*, nov.

The agreement between these specimens and Becker's description (III. p. 134) and figure of this Formosan species is almost exact in all structural details; they differ in being larger ( $2\frac{1}{2}$  mm. as against  $1\frac{1}{2}$  to 2 mm.) and in the fact that

Fig. 21.

*Gampsocera mutata*, var. *grandis*,  $\times 22$ .

the parts coloured palely are not "red-yellow" but more ordinary pale yellow; the venation is also apparently a little aberrant in the costal divisions (see fig. 21).

CEYLON: Peradeniya (*A. Rutherford*).

## CESTOPLECTUS\*, gen. nov.

Four specimens occur which cannot find place in any of the present genera.

*Generic diagnosis*.—Head as in figs. 22, 23, & 24, very compressed axially, so that the horizontal breadth is about three times the vertico-frontal distance and the depth in side-view is nearly twice the axial breadth; facial angle between frontal and facial planes about  $120^\circ$ . Antenna (fig. 25) with large reniform third joint and dorsal pubescent arista; the antennæ are pressed sideways against the face. There is no vertical triangle and no f.-o. bristles; the head-bristles are outer verticals, post-verticals, and small ocellar. The eyes are very densely pubescent, almost hairy.

The thorax is devoid of d.-c., and has one supra-alar and two bristles on the notopleura just before wing-base, placed

\* So named from the face being flattened, as if by a blow.

vertically above one another; other fine hair-like bristles can be seen. The calli are very prominent and large; scutellum with two main bristles and small side ones; it is large and

Fig. 22.

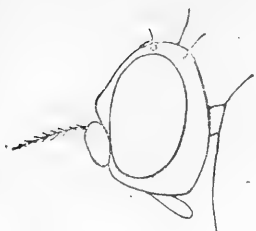


Fig. 23.

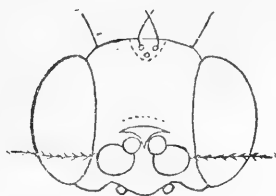


Fig. 24.

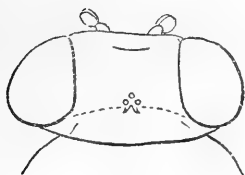
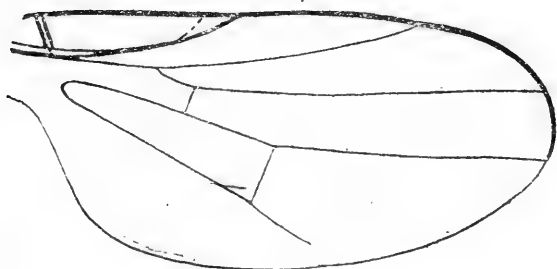


Fig. 25.



Fig. 26.



*Cestoplectus intuens.*

Figs. 22, 23, 24, & 26,  $\times 30$ ; fig. 25,  $\times 75$ .

truly semicircular in profile. Legs long, but quite normal. Wings with venation as in fig. 26. They offer quite an exceptional character, in that some of the veins are provided

with dense rows of hairs. On the lower surface the 2nd vein has a dense row of very short black hairs, getting a little longer towards the costa; the 3rd vein is similarly hairy, but on the upper surface instead of the lower.

The whole insect is orange, with black marks.

*Type*, the following species.

*Cestoplectus intuens*, sp. n.

Head (top and front view, figs. 24 & 23):—All dull orange, with fine hairs; ocellar spot black; in front of it a tiny shining area, which may represent the triangle; a well-marked ridge extends from eye to eye over the antennal bases, and hence the front of frons is slightly hollowed; antennal pits with a narrow median keel between. Antenna (fig. 25) with orange basal joints and deep black 3rd, the pubescent arista also black. Face yellow, the broad inferior eye-margins running up to the antennæ; mouth emarginate; palpi rather club-shaped, black. Side-view (fig. 22): jowls and hind head yellow, the latter with two extremely fine divergent dark lines from neck to vertex.

Thorax: dorsum dullish orange, with pale hairs; two black bands run from the neck over the dorsum, but these terminate some distance before the scutellum, diverging slightly behind; on each side is a largish black oval spot just in front of the well-marked side portion of the cross furrow; behind the furrow is a short black stripe in line with the spot, and there is a similar stripe above the wing-base. The calli are large, almost scale-like, smoother than the dorsum, almost hairless, and brightish yellow. Scutellum as in generic diagnosis, somewhat flattened discally, and there blackened except for an orange median line; it is pale-haired like the dorsum. Pleura shining orange, the margins of the sclerites more or less black-bordered; a large black subrectangular spot over the mid coxa.

Wings (fig. 26) clear, with brown veins, which bear hairs as described above. Halteres all orange.

Legs long, especially the hind pair; all coxæ, trochanters, and femora bright yellow; front and hind tibiæ more or less blackened except at extreme tips, middle tibia orange; front and hind tarsi infuscate on middle of all joints, mid tarsus slightly so on 1st joint.

Abdomen all pitchy black.

Size  $2\frac{1}{2}$  mm. (the abdomen is rather shrunk); wing  $3\frac{1}{2}$  mm.

CEYLON: Peradeniya (A. Rutherford).

## TRICIMBA, Looy.

*(Notonaulax, Becker.)**Tricimba setosa*, sp. n.

A remarkably bristly form, with an unusually shaped scutellum.

Head (top view):—In general appearance and colour very like *T. lineella*; frons dull orange, triangle ill-defined and brown, the base extending across frons at about level of front verticals, the point extending to midway between front ocellus and forehead; the bristles are very strong, two parallel anterior f.-o., the first the smaller, stout inner verticals far forward, just beyond ocelli (possibly really the upper f.-o.); strong convergent post-verticals placed on vertical ridge just behind the hind ocelli, and strong parallel ocellars just in front of these ocelli; all the bristles are black. Face orange, as are the antennæ, except for the tiny black tip of the 3rd joint; arista almost black, long, fully  $1\frac{1}{2}$  times as long as in *lineella*, with long basal joints and faintly pubescent flagellum. Side-view: jowls all orange, considerably deeper than *lineella*, about  $1\frac{1}{2}$  times the depth of 3rd joint; orange vibrissa; palpi thick and orange, as is the tongue. Hind head grey, dusted with brown; two fine divergent orange lines from neck to vertex.

Thorax much the same in colour and dusting as in *lineella*, but with somewhat brighter pollen; the punctured lines quite the same in character, the middle one with single-rowed punctures, side ones double-rowed, though not so right to the front; callus orange; the bristles present are as in *lineella*, not short and orange as in that species, but quite long, stout, and black. Scutellum subtriangular, with flat disc, similar to dorsum, but orange at tip; terminal bristles parallel, black and very long, with a shorter black one on each side; pleura dark orange, dusted except behind front coxa.

Wings in general appearance very like those of *lineella*, but the venation differs as follows:—Last cross-vein not sloped, nearly perpendicular, considerably more remote from the small cross-vein; end of 2nd much nearer end of 3rd. Halteres pale yellow.

Legs entirely yellow, except for claws.

Abdomen dullish orange-black, brighter towards sides.

Size 3 mm.

NATAL: Durban (*F. Muir*); S. RHODESIA: Salisbury (*G. A. K. Marshall*).

## OSCINIS, Macq.

(modo, *Oscinella*, Becker.)

The number of examples in this genus is not very large, and several of the very obscure black species are represented by single specimens; further, a good many were damaged, so that there are only the following that can be made out with fair certainty:—

*O. maura*, Flin.

Several specimens which cannot be separated from forms of this widely spread species.

NATAL: Durban (*F. Muir*, Camb. Coll.).

*O. complicata*, Beck.

Specimens from Durban (*F. Muir*) are quite indistinguishable from the specimens from the Seychelles on which the species was founded by the author under the name *O. oculata* (Trans. Linn. Soc. xv. part 3, 1912, p. 340; see same, xvi. part 4, 1914, p. 370).

*O. maculata*, Beck.?

There is a single specimen from Africa which is either a bright form of *O. maculata* described by Becker (III. p. 158) from New Guinea or a closely allied species of that group, which is characterized by a very undulated 4th vein running just up to the vein-tip. It is unstriped, as are some forms of Becker's species, but is apparently more shining and a little larger. The sternopleural spot is only just visible, owing to the position of the pin.

Size  $1\frac{1}{2}$  mm.

S. RHODESIA: Salisbury (*G. A. K. Marshall*).

*O. ornatifrons*, Meij.?

There are two specimens, both rather worn, which accord with fair exactness with the description. The d.-c. bristles are very small, but all the colour-characters of head &c. hold if one allows for the dilapidated state. The only real difference is a slight one in the colour of the legs, these being



more dusky than the description would indicate ; all the tibiæ are  $\frac{2}{3}$  blackened, front tarsus, other tarsi on last joints, and middle of hind femur also black.

Though the species was originally described from New Guinea, I can only consider these specimens to be a local form.

NATAL: Durban (*F. Muir*, Camb. Coll.).

*Oscinis longipes*, sp. n.

There is a single female specimen from South Africa which must be mentioned, in spite of the objection to single-specimen species. It is an abnormal form of the *atricornis* group, differing in size, venation, form of antenna, and in its very long legs. When the genus is fully investigated, this will probably be recognized as being of generic rank.

Head, generally speaking, like that of an ordinary black *Oscinis*: top view, all black, the triangle excessively shining black and very large, the base lying across the vertex, the point

Fig. 27.



*Oscinis longipes*,  $\times 22$ .

over the antennæ, the sides much arched, so as to leave the eye-margins narrower than usual and evanescent at vertex. Face rather blackened behind antennæ, but lower half pale yellow ; antenna blackish brown, 2nd joint large, 3rd quite large, oval in outline, and about as broad as face ; the well-pubescent arista is also brown. Side-view : eyes faintly and sparsely pubescent, large, the frontal and anterior boundary quite circular in outline, leaving only the tip of frons just visible, the posterior and inferior boundary more flattened, leaving the linear lower jowls and well-marked somewhat swollen hind jowls visible, these being all black ; small vibrissa ; palpi retracted, orange ; tongue with a recurved tip, the base black, the tip yellow. Hind head all black. The

specimen is in only moderate condition, but the bristles are normal as far as they can be seen.

Thorax all entirely black and shining, with barely visible rows of tiny hairs, such as occur in other Oscinids; main bristles normal, where present.

Wings as figured (fig. 27), slightly browned, with brown veins; from the end of 2 to that of 4 the wing has a somewhat darker brownish border. Halteres yellow.

Legs long, the hind pair quite exceptionally so, the femur being about as long as the abdomen (excluding the ovipositor); the tibia is about  $\frac{3}{4}$  of the femur in length, and the tarsus equal to it; in colour pale orange, except that the front and middle pair are slightly suffused distally on the tarsi; the middle pair has a black spot on tip of femur; the hind femur is blackened for the apical third, the tibia for its distal two-thirds and is so far a little swollen, the tarsus all black.

Abdomen parallel-sided, rather narrow, somewhat flattened, shining black, with a red tinge owing to the pale orange venter showing through the thin chitin. The ovipositor is long, triangular in profile, forming a jointed tube about half the length of the abdomen proper; in colour it is brown.

Length, without ovipositor, 3 mm.; wing about  $2\frac{3}{4}$  mm.; hind leg nearly 3 mm.

NATAL: Durban (*F. Muir*, Camb. Coll.).

*Oscinis bistriata*, sp. n.

Head (top view):—Mainly dull yellow with tiny black hairs; triangle slightly raised, with the boundaries extending to the vertical angles behind the eyes, sides concave, point about halfway from ocellus to frons; the fore part (including the slightly raised ocellar hump) is black, rather dull, the side areas between this and the boundary orange; this colour extends over the hind head a short distance, and the bristles are inserted on it just *over* the vertical ridge; the black of the ocellar patch also extends behind between the orange patches, and merges into the lower black part of the hind head. Eyes with very short but strong pubescence. Face orange, with the frons overhanging the antennal bases, the antenna with orange 2nd joint, the 3rd black-brown, but with a narrow border of yellow round the edge inside; arista brown, with just perceptible pubescence. Side-view (fig. 28): projecting frons yellow, as is the jowl, the latter orange behind the eye.

Thorax, dorsum, and scutellum subshining brown-black, with very short apparently black hairs, those on the rounded scutellum a little longer and much more widely scattered; long, nearly parallel, terminal bristles, with one short side-bristle; in side-light both bristles and hairs appear golden brown. Along the dorsum run two narrow, shallow, non-punctate sulci which are dull yellow, and these stripes just run on to the basal angles of the scutellum; callus orange; pleura and metanotum shining orange-black, the latter the darker.

Wings (fig. 29) clear, just perceptibly yellow between 1 and 2, veins brown. Halteres pale yellow.

Fig. 28.



Fig. 29.



*Oscinis bistrata*.

Fig. 28,  $\times 40$ ; fig. 29,  $\times 22$ .

Legs all dull orange, femora with the faintest possible suffusion.

Abdomen slightly shining, blackish, paler at the base.

Size  $1\frac{1}{2}$  mm.; wing a little more.

BRITISH EAST AFRICA: Njoro (*T. J. Anderson*).

*ANOMÆOCEROS*, gen. nov.

In the collection are two pairs of a remarkable form exhibiting marked sexual dimorphism in the antenna. The eyes and most of the body are densely haired. It would almost seem that they bear somewhat the same relation to the New Guinea genus *Thyridula* (Becker, III. p. 94) as the new genus *Bathyparia* bears to *Euryparia*.

*Generic diagnosis*.—The large head (fig. 30) bears a big punctured triangle, which carries a shining broad central

stripe; the whole frons except the stripe is hairy. Eyes large, upright long-oval, extremely pubescent, almost hairy. The head-bristles are outer vertical, approximated post-vertical, tiny ocellars bent backwards, all of them pale. The ♂ has a largish antenna (fig. 31), with a comparatively long 2nd joint and a triangularly pointed 3rd; the arista is inserted basally and has abnormally long basal joints and a pubescent flagellum. The ♀ has an ordinary 2nd (fig. 32), an oval 3rd with rather acute upper angle, and a similar arista. Thorax all punctured and black, with dense fairly long yellowish hairs, well seen when viewed sideways; the scutellum is similar, somewhat swollen, in profile a long round-tipped triangle, with two terminal tubercles carrying long orange bristles; alongside the end-tubercles on the lower surface are some smaller auxiliary ones with much smaller similar bristles. Only the last d.-c. and the notopleural bristles present, all orange. Wings (fig. 33) a little darkened in male. Legs rather stout, especially so in male.

*Type*, the following species.

*Note*.—The specimens are only in moderate condition, and the bristles are easily detached; hence the above characters are compiled from all the specimens.

*Anomæoceros hispidus*, sp. n.

♂. Head (top-front view, fig. 30):—All brown-haired, frons black, the punctured triangle with base not quite across vertex and point down to antennæ, the central stripe very shining, the hairs just over antenna white and longer. Antennæ as fig. 31, 2nd joint orange, very hairy inside, 3rd basally orange, apically from just before the arista black; arista pale orange, with dark-haired flagellum. Front view: the antennæ have long shallow separate foveæ, the bottom of these being dusted grey, as are lines near the edges of the very hairy eyes. Side-view as fig. 34; palpi orange.

Thorax: dorsum and scutellum similarly and finely punctate, pale-haired (see above); calli very prominent, but like rest of dorsum; scutellum as above. Pleura all shining black, with few hairs.

Wings long (fig. 33), dusky, with stout brown veins. Halteres with shining black knob.

Legs stout and hairy; all coxæ black, all trochanters orange, all the femora a little swollen and black (except knees); front femur orange with a small dark ring, middle

with a bigger ring, hind all black : all tarsi paler orange except the darkened last three joints of hind tarsus.

Abdomen extensively red on the three basal segments, the rest brown-black with pale margins, covered with fine pale hairs. A small imbedded hypopygial knob below.

♀. Less robust, less hairy, a little smaller, legs less stout ;

Fig. 30.

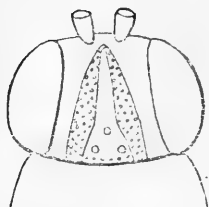


Fig. 31.



Fig. 32.



Fig. 33.

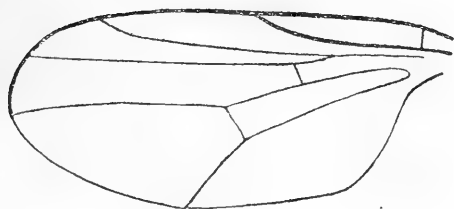
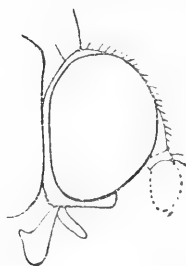


Fig. 34.



*Anomæoceros hispidus.*

Figs. 30 & 34,  $\times 30$  ; fig. 31 ( $\sigma$ ) & 32 ( $\varphi$ ),  $\times 50$  ; fig. 33,  $\times 22$ .

abdomen elongate, the last segments forming a longish triangular tubular ovipositing apparatus ; no pale margins to the segments. Other differences as in generic diagnosis ; otherwise like  $\sigma$ .

Size  $2\frac{1}{2}$ –3 mm. ; wings about  $\frac{1}{3}$  longer.

S. RHODESIA: Salisbury (G. A. K. Marshall, Camb. Coll.).

XLVIII.—On the Origin and Affinities of the Acari of the Family Demodecidæ, with Brief Remarks on the Morphology of the Group. By STANLEY HIRST.

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THE mites of the family Demodecidæ are regarded by most acarologists as an isolated group, and, owing to the extreme elongation of the body and annulation of the abdomen, they are usually placed with the Tetrapoda (Eriophyidæ), a family also exhibiting these peculiarities, but otherwise very dissimilar in structure. Oudemans has hinted at their derivation from the Sarcoptidæ (Astigmata) parasitic in mammals, and has also drawn attention to the rather close resemblance of *Demodex* to the Cheletid mite *Psorergates* belonging to the order Prostigmata. There can be little doubt that the Demodecidæ are closely related to the Cheletidæ, and probably are an offshoot from that family. The male sexual organ opening is dorsal in position in *Demodex*, being placed well forward on the cephalothorax, and this is also well known to be the case in the Cheletidæ, notably in the genus *Myobia* etc. The penis is a slender elongated structure of considerable size in both these families, and is attached by the posterior end, the anterior end being directed forwards and upwards. The mouth-parts of *Demodex* are very like those of *Psorergates*, and in the former genus a pair of minute ventral stigmata are present at the base of the capitulum. The respiratory system is said to be absent in the family Demodecidæ, but it is improbable that this is really the case, and I have seen internal tracheæ of a very similar type to those present in Cheletidæ. The nymphs of the genus *Demodex* differ from the adults in important details of structure, being provided with simple lateral plates or epimera (each of which bears a pair of tubercles furnished with very minute denticles) instead of the fully developed legs of the mature form. Four central pairs of curious epidermal discs bearing minute spines on their posterior margin are also present on the ventral surface of the body. Further details are given in my revision of the family Demodecidæ, which will be sent to press shortly.

XLIX.—*The Type-specimens of Pœcilasma carinatum, Hoek (Cirripedia)*. By W. T. CALMAN, D.Sc.

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IN the Report on the Cirripedia of the 'Challenger' Expedition, Hoek described two species of *Pœcilasma* (*P. carinatum* and *P. gracile*) differing from all those referred to the genus by Darwin in having the sides of the carina expanded below. Pilsbry, in 1907, transferred these species to Hoek's genus *Megalasma*, placing them in a new subgenus, *Glyptelasma*, with *M. subcarinatum*, Pilsbry, as the type-species. Annandale, more recently (1916), has transferred *Glyptelasma* to *Pœcilasma*, believing that the included species have more affinity with that genus than with *Megalasma*.

A re-examination of the type-specimens of *P. carinatum* and of the specimen described by Gravel in 1901 reveals certain omissions and errors in the original descriptions which deserve to be noticed, since they affect not only the specific but also the generic and subgeneric definitions.

*Megalasma (Glyptelasma) carinatum* (Hoek).

*Pœcilasma carinatum*, Hoek, Rep. 'Challenger' Cirripedia, 1883, p. 44, pl. i. figs. 8-10, pl. ii. fig. 1, pl. vii. figs. 6, 7; id. 'Siboga' Exp., Cirripedia Pedunc. 1907, p. 5, pl. i. fig. 1; Gravel, Trans. Linn. Soc. London, Zool. viii. 1901, p. 157, pl. xvii. figs. 9-16.

*Megalasma (Glyptelasma) carinatum*, Pilsbry, Bull. U.S. Nat. Mus. lx. 1907, p. 93; id. Proc. Acad. Nat. Sci. Philadelphia, lix. 1907, p. 416.

*Material examined*.—Hoek, in his 'Challenger' Report, mentions six specimens of this species. One, from Station 24, off Culebra Island, is no longer in the collection. From Station 344, off Ascension Island, he records "Three specimens and two very small ones." The bottle bearing the label of this station now contains six specimens ranging from 1.75 mm. to 14 mm. in length of capitulum. The largest of these is represented by the capitular valves (the carina and one scutum separated from the others) and by a partially dissected body with ovigerous lamellæ still attached. Since the capitular length of this individual is that indicated by Hoek for his largest specimen, and since it appears to have furnished the material for most of his figures and much of his description, I have selected it as the holotype.

With regard to Hoek's figure of the entire animal there is some difficulty. He says (Chall. Rep. p. 45):—"Capitulum  
Ann. & Mag. N. Hist. Ser. 9. Vol. i. 27

.... in the largest specimen narrower than in the smaller ones. Fig. 8 (pl. i.) represents one of the smaller ones." The figure, however, measures 28 mm. in length of capitulum, and as it is stated to be "magnified two diameters," it would correspond exactly in this dimension with the largest of the type-specimens. Its width represents an actual measurement of 8.5 mm., which is considerably greater than that of any of the specimens. It does not seem possible, therefore, to identify this figure with any individual specimen, although in the form of the scutum, and particularly in the angle formed by its basal and ocludent margins, it shows a certain similarity to the second in point of size among the type-specimens. This individual, of which the capitulum measures 9 mm. in length, is described separately below.

The Museum also possesses \* the remains of the specimen described and figured by Gruvel, as well as a number of other specimens from the same locality ("off coast of Cuba") which were seen but not examined in detail by him (Gruvel, *t. c.* p. 159). Some error has crept into Gruvel's measurements of his specimen. He gives the length of capitulum as 14 mm. and its width as  $4\frac{1}{2}$  mm., and his statement that it is about three times as long as wide has been copied by Pilsbry, who regards this as the chief character distinguishing the species from his *M. subcarinatum*. The statement, however, is in conflict with Gruvel's own camera drawing of the outline (*t. c.* pl. xvii. fig. 9) and with the specimen itself. When the valves are placed together the capitulum measures about 13 mm. by 6 mm., a proportion which agrees well with Gruvel's drawing.

*Description of Holotype.*—Valves covered with a fine nearly colourless cuticle, without setæ. Lines of growth well-marked, with finer concentric ridges between; radial striations very fine, but distinct. Scutum (fig. 1, A) twice as long as wide, ocludent margin convex, tergal margin straight, carinal margin convex above, deeply concave below, basal margin forming an even curve with ocludent margin, with the chord of which it makes a very obtuse angle; basicarinal angle acute and recurved. Ridge from umbo to apex well-marked, curved, distant from ocludent margin except near the ends; ridge from umbo to carino-tergal angle low and rounded but distinct. A small umbonal tooth on inner surface of both valves and a basal area which is radially and

\* Unfortunately the history of these specimens is incomplete, and the indications of locality and depth quoted by Gruvel from the labels cannot now be confirmed.



concentrically striated (fig. 1, B). *Tergum* (fig. 1, A) with carinal margin rather less than half as long as occludent margin and inclined towards it above. *Carina* (fig. 1, A, C) evenly arcuate, upper portion narrow, its transverse width above not more than one-twelfth of the length of the valve; sides expanded in the lower third; septum concave, the

Fig. 1.



*Megalasma (Glyptelasma) carinatum* (Hoek), holotype.

A. Valves of the capitulum, lateral view. B. Basal angle of scutum, inner surface. C. Carina, inner surface.

lateral lobes projecting as seen from the side; basal margin forming a slightly convex curve with that of the scutum when the valves are in their natural position and viewed from the side.

Dorsal surface of prosoma provided with long *filamentary appendages* arranged in two series (cf. fig. 3). The exact

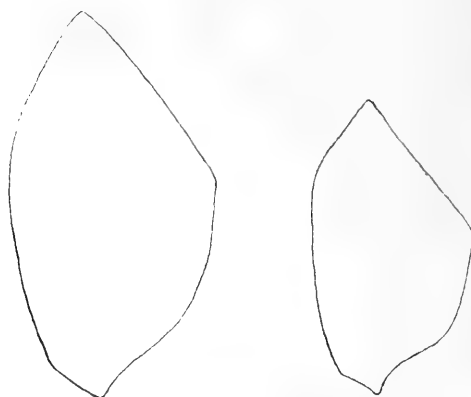
number of these is difficult to ascertain and the arrangement is not quite regular, but at least ten appendages can be counted on one side, the most anterior attached close to the point of origin of the mantle-fold.

The mouth-parts and the first pair of cirri have been removed. The *second cirrus* is present on the right side; it has the rami subequal in length, each with sixteen segments. The *fourth cirrus* has, on the middle segments, five pairs of spines, and the posterior setæ are shorter than the segments. The posterior cirri and the caudal appendages are wanting.

*Measurements of Holotype.*—

	mm.
Length of capitulum (approx.)	14
Breadth                   "                   "	6.5
Length of scutum	12
Breadth                   "                   "	6
Length of tergum (apex to scuto-carinal angle)	7.25
Length of carina	9.5
Width                   "                   (near apex)	0.8
Width                   "                   (at base, approx.)	1.2

Fig. 2.

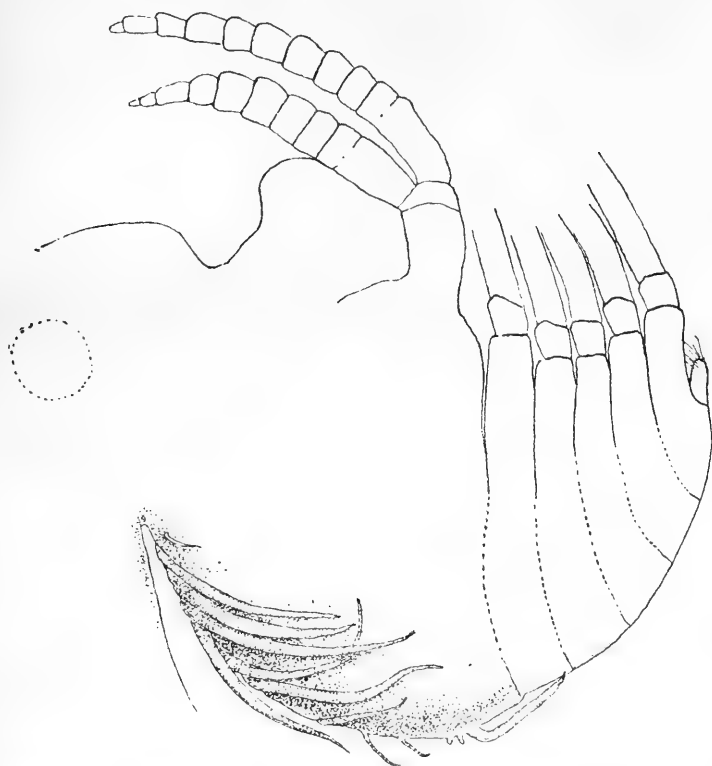


Outlines of scuta from two paratypes of *Megalasma (Glyptelasma) carinatum* (Hoek). The larger from a specimen of capitular length 8.5 mm., the smaller from one measuring 6.5 mm.

*Variation.*—The paratypes, which are all much smaller than the holotype, differ from it more or less in the outline of the scutum (fig. 2). The basal margin is straight or even slightly concave, and its junction with the occludent margin at the umbo is marked by a distinct angle; the angle formed

with the chord of the occludent margin is always very obtuse. The convexity of the occludent margin varies considerably, as shown in the figures, and so also does the curvature of the carinal margin. The median ridge of the carina stops a little short of the base, forming a tooth which is most prominent in the smallest specimens.

Fig. 3.



*Megalasma (Glyptelasma) carinatum* (Hoek). Specimen from coast of Cuba. Body, from the side, to show dorsal filamentary appendages, first cirrus, and caudal appendages.

In the specimen figured by Gruvel the outline of the scutum differs only very slightly from that of the holotype; Gruvel's figures represent rather too sharp an angle between the basal and occludent margins. The other specimens from the same locality show considerable variation in this respect;

the basal margin may form a continuous curve with the ocludent margin or it may meet it in a distinct angle at the umbo; the angle which it forms with the chord of the ocludent margin varies, although it is always noticeably greater than a right angle; the basal margin may be straight or slightly concave or convex; and it may be equal to or shorter than the base of the carina.

In Gruvel's specimen and in the others that have been dissected the filamentary appendages (fig. 3), although varying in number, resemble those found in the holotype; there are usually some six or seven pairs of very long appendages on the anterior part of the tergal surface of the prosoma, followed by a number of shorter ones, some of which may, as in the specimen figured, be reduced to papillæ.

The asymmetry of the mandibles observed by Hoek and again found in Gruvel's specimen is by no means constant; as a rule, both mandibles have three teeth in addition to a bidentate inner angle, but smaller intermediate teeth may be developed in some or all of the intervals between the larger teeth.

The rami of the first pair of cirri (fig. 3) have respectively ten and eleven segments, at least one of the proximal segments being, as usual, very indistinctly defined. The posterior cirri in large specimens have a small sixth pair of spines in addition to those observed in the holotype. The caudal appendages (fig. 3) may exceed one-fourth of the length of the peduncle of the sixth cirrus.

The largest of the specimens from the coast of Cuba measures 23 mm. in length and 10.5 mm. in breadth of capitulum.

*Megalasma (Glyptelasma) sp.*

The specimen here recorded was found, as mentioned above, among the syntypes of *P. carinatum*. The capitulum measures 9.5 mm. in length by 4.6 mm. in width. It differs from all the specimens described above in the following characters:—

(1) The cuticle of the capitulum is everywhere beset with short fine setæ.

(2) The straight basal margin of the scutum is at right angles to the chord of the ocludent margin, and is a little longer than the concave basal margin of the carina.

(3) There are no filamentary appendages.

(4) The caudal appendages are extremely short, not more

than one-twelfth of the length of the peduncle of the sixth cirri.

The mandible has three teeth and a forked inner angle; the first cirri have eight segments in each ramus; the posterior cirri have four or five pairs of spines on the middle segments, the proximal pair very small.

This specimen doubtless represents a species distinct from *M. carinatum*, but it is not so easy to be sure that it is distinct from some of the other species of the subgenus, in which the appendages have not been described. Since it is solitary and probably immature, it seems inadvisable to distinguish it by a new specific name.

#### *General Remarks.*

In establishing the genus *Pæcilasma*, Darwin stated the filamentary appendages were absent (Lepadidæ, p. 100), and the statement is repeated by Gruvel and by Annandale. Hoek does not mention these structures, and Pilsbry (Bull. U.S. Nat. Mus. lx. 1907, p. 82) merely says of *Pæcilasma* "No lateral filaments at bases of the cirri," and does not mention the character under *Megalasma*. There is evidently considerable diversity as regards these appendages in the species referred to *Glyptelasma*, and in some species they are absent altogether, as they are in *Pæcilasma*, s. str. They may furnish characters valuable for the discrimination of species in this group, subject to the caution suggested by their known variability in size and number in the species of *Lepas* (Darwin, Lepadidæ, pp. 70-71).

Annandale's transference of the subgenus *Glyptelasma* from *Megalasma* to *Pæcilasma* is not supported by the facts here recorded. Apart from the carina, *Megalasma* is distinguished from *Pæcilasma* by the form of the scuta, in which, as Pilsbry expresses it, "there has been a rotation of the basal margin of the scutum through 90°, bringing it in line with the occludent margin." The specimens discussed above show intermediate stages between those in which the basal margin is at right angles to the chord of the occludent margin and those like the holotype of *M. carinatum*, in which the two margins form a continuous curve. From these to the typical forms of *Megalasma* the change is very slight, and I therefore follow Pilsbry in including the species of *Glyptelasma* in that genus.

*M. subcarinatum*, Pilsbry, the type of the subgenus, does not differ greatly from *M. carinatum* in the proportional

width of the capitulum, but in some of the other characters mentioned by Pilsbry it seems to be quite distinct. The basal width of the capitulum is relatively greater, the basal margin of the scutum appears to be at right angles to the chord of the ocelluent margin, the carina is straighter, and the width of its upper part is about one-sixth of its length. No details are given as to the appendages.

L.—*On new Hymenoptera of the Family Evaniidæ in the British Museum.* By ROWLAND E. TURNER, F.Z.S., F.E.S.

*Hyptiogaster rufus*, Westw.

*Fœnus rufus*, Westw. Ann. & Mag. Nat. Hist. (1) vii. p. 537 (1841). ♂; Westw. Trans. Ent. Soc. London, (2) i. p. 222 (1851). ♀.

*Hyptiogaster macrochela*, Kieff. Ann. Soc. Ent. France, lxxx. p. 180 (1911). ♂.

*Hyptiogaster arenicola*, sp. n.

♀. Ferruginea; vertice fascia transversa nigra; valvulis terebræ nigris, tertio apicali flavidulis; alis hyalinis, venis fuscis, stigmatate ferrugineo.

Long. 14–16 mm.; terebræ long. 6 mm.

♂. Feminae similis, vertice fronteque nigris.

Long. 16–17 mm.

♀. Head fairly large, broader than the thorax; the posterior margin distinctly raised and broadly emarginate, separated from the eyes by a distance equal to about one-third of their length. Vertex and front coarsely punctured-rugose; the face below the antennæ less coarsely punctured-rugose, punctured in the middle; a triangular tubercle between the antennæ. Clypeus somewhat shining, microscopically punctured, with sparse larger punctures intermingled, the apical margin almost straight. Second joint of the flagellum a little longer than the third, more than four times as long as the first; posterior ocelli separated from each other by a distance equal to two-thirds of the length of the second joint of the flagellum, a little nearer to the eyes than to each other. Neck short; pronotum not produced at the angles; thorax coarsely rugose; the mesonotum distinctly margined both anteriorly and laterally, the anterior margin straight; pleuræ less coarsely rugose; median segment rugose-reticulate

without a sulcus; hind coxæ indistinctly transversely striated, with punctures between the striæ. Abdomen a little less than twice as long as the head and thorax combined; terebra half as long again as the petiole. Hind metatarsus not abnormally thickened, equal in length to the four apical tarsal joints; tarsal ungues normal.

♂. Second joint of the flagellum five times as long as the first.

*Hab.* Yallingup, S.W. Australia (*Turner*), December 1913-January 1914.

This is very near *H. rufa*, Westw., but has the terebra very distinctly shorter, only 6 mm. as compared with 8 mm. in *H. rufa*.

Twelve males and eight females taken flying low over sand.

*Hyptiogaster asymmetrica*, sp. n.

♀. Fusco-ferruginea, plerumque nigro-suffusa; alis saturate hyalinis; venis fuscis, basi testaceis; terebra recurvata, haud exserta.

♂. Feminæ similis.

Long., ♀ 18, ♂ 20 mm.

♀. Head a little broader than the thorax, the posterior margin raised and widely emarginate; posterior ocelli as far from the eyes as from each other, and as far from the eyes as from the posterior margin of the head. Vertex opaque, sparsely but rather deeply punctured; front and ocellar region coarsely punctured-rugose, face finely rugulose; clypeus minutely and closely punctured; the mandibles coarsely punctured at the base, smooth at the apex. Second joint of the flagellum four times as long as the first, equal to the combined length of the third and fourth, which are subequal; a strong carina between the antennæ not reaching the anterior ocellus. Neck very short; pronotum not produced at the angles; mesonotum coarsely transversely rugose, the anterior margin straight; a narrow, slightly depressed area in the middle of the anterior margin not extending as far as the middle of the middle lobe, this depression is transversely striated. Scutellum rugose, with one or two transverse striæ; pleuræ closely and finely punctured and clothed with very delicate whitish pubescence; median segment transversely rugulose, without a sulcus; hind coxæ finely transversely striated. Hind metatarsus broad, as long as the three following joints, the three basal joints of the hind tarsi strongly asymmetrical, the outer lobe of the third joint

reaching beyond the apex of the fourth, all the joints much longer than broad, unguis normal. On the sides of the abdomen are oblique bands of whitish pubescence. The terebra is recurved and does not extend beyond the apex of the abdomen. Base of the petiole very finely transversely rugulose.

♂. Very similar to the female, but the joints of the hind tarsi are not so strongly asymmetrical, the outer lobe of the third joint does not extend as far as the apex of the fourth. The abdomen is longer and more slender than in the female.

*Hab.* Yallingup, S.W. Australia (*Turner*), October 1913; eight males and fourteen females.

The asymmetrical hind tarsi show an approach to those of *Hemifœnus brevithorax*, Kieff., but the joints are broader and less strongly asymmetrical than in that species. I cannot regard *Hemifœnus* as a good genus; *H. brevithorax* appears to differ less from the section of *Hyptiogaster* to which the present species belongs, which seems to be the typical group, than that section differs from the section of *H. rufa*, Westw.

*Hyptiogaster inæqualis*, sp. n.

♀. Ferruginea, macula circum ocellos, mesonotoque fascia longitudinali nigris; alis hyalinis, venis ferrugineis; terebra recurvata, haud exserta.

Long. 10–11 mm.

♀. Head narrowed behind the eyes; the posterior margin raised and strongly emarginate; separated from the eyes by a distance equal to nearly half their length. Vertex and face almost smooth, subopaque; the front strongly convex in the middle, with a longitudinal carina from between the antennæ nearly reaching the anterior ocellus; on each side of the carina the front is very finely rugulose. Posterior ocelli as far from the eyes as from each other. Second joint of the flagellum nearly five times as long as the first, very little shorter than the third and fourth combined. Mesonotum coarsely rugose, rounded anteriorly, with two short longitudinal carinæ from near the middle of the anterior margin; pronotum not produced at the angles; scutellum transversely rugose-striate; pleuræ minutely punctured; median segment punctured-rugose; hind coxæ finely and closely punctured. Petiole as long as the four following segments combined, the terebra recurved and usually hidden, not reaching beyond the apex of the abdomen. Hind metatarsus longer than the three following joints, about twice as long as broad, the three intermediate joints as broad as long, not asymmetrical; the



apical joint slender, longer than the second and third combined, unguis of the hind tarsi almost as long as the apical joint of the tarsi, the other tarsal unguis small.

*Hab.* Yallingup, S.W. Australia (*Turner*): November and December 1913.

This belongs to the section of the genus in which the terebra is not exerted and is recurved. In this section the third and fourth joints of the flagellum are short, their combined length being scarcely if at all greater than that of the second joint. In the group of *rufa* and *humeralis*, in which the terebra is straight and exerted, the third and fourth joints of the flagellum are each almost as long as the second. Except in the presence of two discoidal cells instead of one, this species and its allies nearly approach typical *Pseudofænus* from New Zealand. American and Australian species with the neurulation of *Pseudofænus* are slender insects much more nearly allied to *Fænus*.

*Hyptiogaster darwinii*, Westw.

*Fænus darwinii*, Westw. Ann. & Mag. Nat. Hist. (1) vii. p. 537 (1841). ♂.

*Pseudofænus darwinii*, Kieff. Das Tierreich, xxx., Evaniidæ, p. 211 (1912).

This belongs to *Hyptiogaster*, having two discoidal cells and the cubital vein springing from the basal nervure. A specimen from Darwin's collection, almost certainly the type, is in the British Museum, but the abdomen is lost.

*Hyptiogaster nitidiuscula*, sp. n.

♀. Brunneo-ferruginea; mesonoto nigro-suffuso, punctato, haud rugoso; alis hyalinis, venis fuscis; terebra recurvata, haud exserta.

♂. Feminæ similis.

Long. 8-10 mm.

♀. Very similar to *H. inæqualis*, described above, but differs in the following points:—Less robust; front much less convex in the middle, the carina not as strongly raised, the front sparsely punctured. Second joint of the flagellum three and a half times as long as the first, as long as the third and fourth combined. Mesonotum deeply and strongly punctured, not rugose, the punctures distinctly separated. Unguis of the hind tarsi small as in the other tarsi, hind metatarsus a little longer than the three following joints combined, all the joints normal, longer than broad, only slightly asymmetrical.

*Hab.* Yallingup, S.W. Australia (*Turner*), December 1913.

*Hyptiogaster minima*, sp. n.

♀. Nigra, scutello basi, segmento mediano, propleuris, abdomine-  
que subtus fusco-ferrugineis; alis hyalinis, venis fuscis, stigmatibus  
ferrugineo; terebra recurvata, haud exserta.

Long. 4 mm.

♀. Head broader than the thorax, very finely and closely punctured, the front not convex, the frontal carina obsolete. Second joint of flagellum rather slender, two and a half times as long as the first, distinctly shorter than the third and fourth combined. Mesonotum short, much broader than long, finely and closely punctured, longitudinally depressed in the middle anteriorly, the depressed space finely transversely striated; pleurae and scutellum finely and closely punctured; median segment very delicately transversely rugulose; hind coxae smooth and shining. Tarsal ungues very small, tarsi slender; hind metatarsus as long as the four apical joints combined, not broadened, the joints of the hind tarsi not asymmetrical.

*Hab.* Mt. Wellington, Tasmania, 2300 ft. (Turner), January 1913; one female.

The neck is short and the thorax is quite as short as in *Hemifænus brevithorax*, Kieff., but the structure of the hind tarsi is very different. The species is also much smaller and less robust. The absence of the frontal carina is also a point of agreement with *H. brevithorax*, and a point of difference from typical *Hyptiogaster*. *H. brevithorax* also occurs on Mt. Wellington in January.

*Hyptiogaster floricola*, sp. n.

♀. Nigra; coxis anticis subtus, tarsis anticis, mandibulis, pleuris in medio nigro-fasciatis, segmento mediano testaceis; alis hyalinis, venis fusco-ferrugineis; terebra recurvata, haud exserta.

♂. Feminae similis.

Long., ♂ ♀, 5-6 mm.

♀. Head much broader than the thorax; vertex smooth and shining, front closely and finely punctured, without a carina; front and clypeus subopaque, microscopically punctured. Second joint of the flagellum about three and a half times as long as the first, distinctly shorter than the third and fourth combined. Posterior ocelli a little further from each other than from the eyes, and a little further from the hind margin of the head than from each other. Pronotum not produced at the angles, mesonotum as long as broad, rounded at the anterior angles, coarsely rugose, transversely

rugose-striate anteriorly; scutellum rugose; pleuræ minutely punctured; median segment rugulose; hind coxæ very delicately transversely striated. All the tarsal ungues small; hind metatarsus longer than the three following joints, but shorter than the four apical joints combined, the joints slender and symmetrical.

*Hab.* Kalamunda, S.W. Australia (*Turner*), February.

A long series taken on blossom of *Eucalyptus calophylla*.

Differs from the nearly allied *H. minima* described above in the colour of the pleuræ and median segment, in the larger size, the sculpture of the head and thorax, and the longer and narrower mesonotum, also in the proportion of the joints of the flagellum and other details.

*Pseudofænus crassipes*, Sm.

*Fænus crassipes*, Sm. Trans. Ent. Soc. London, p. 479 (1876). ♀.

*Aulacofænus crassipes*, Kieff. Das Tierreich, xxx., Evaniidæ, p. 193 (1912).

Smith states that the two oblique sutures on the mesonotum meet at the scutellum, which is apparently the reason which led Kieffer to place the species in *Aulacofænus*. But Smith's statement is erroneous; the species is congeneric with *P. pedunculatus*, Schlett., the type of *Pseudofænus*.

*Fænus rugosissimus*, sp. n.

♀. Nigra; mandibulis apice excepto, coxis anticis, coxis intermediiis supra, trochanteribus femoribusque anticis intermediiisque, femoribus posticis infra, tibiisque anticis intermediiisque infra ferrugineis; tegulis testaceis; valvulis terebræ tertio apicali, tibiis anticis intermediiisque supra, tibiis posticis macula magna basali infra tarsisque albo-flavidulis; metatarso postico dimidio basali nigro; terebra abdomine paullo brevior; alis hyalinis, venis nigris.

♂. Feminæ similis; tibiis posticis infra ferrugineo-lineatis, haud albido-maculatis.

Long., ♀, 19 mm., terebræ long. 11 mm.; ♂, 17–19 mm.

♀. Vertex and front coarsely rugose; face opaque, sparsely punctured, clypeus microscopically punctured; head behind the eyes broad and slightly swollen; the hind margin distinctly raised. Cheeks as long as the first joint of the flagellum. Second joint of the flagellum fully half as long again as the first, the third very distinctly longer than the first and second combined. A low longitudinal carina between the antennæ. Neck very short and stout; mesonotum and

scutellum coarsely rugose, median segment punctured-reticulate; the mesonotum with two short longitudinal carinae from near the middle of the anterior margin. Angles of the pronotum produced into a minute spine on each side. Pleuræ finely punctured-rugulose and sparsely clothed with very delicate white pubescence; hind coxæ shining, indistinctly transversely striated at the base.

*Hab.* Yallingup, S.W. Australia (*Turner*), November and December 1913; five males and sixteen females.

Very nearly allied to *F. rogenhoferi*, Schlett., which is only known to me by description, but differs in the much shorter terebra and in the very small development of the angles of the pronotum.

*Pristaulacus fuscocostalis*, sp. n.

♀. Nigra; tarsis anticis brunneis; alis subhyalinis, costa cellulae radiali late infuscatis.

Long. 19 mm.; terebræ long. 19 mm.

♀. Head behind the ocelli subopaque, smooth; front opaque, coriaceous. Cheeks fully as long as the scape. Second joint of the flagellum three times as long as the first, half as long again as the scape, third joint distinctly longer than the first and second combined. Head not margined posteriorly; the posterior ocelli nearer to the eyes than to each other, separated from the eyes by a distance equal to the length of the first joint of the flagellum. Neck not very short; mesonotum coarsely transversely striated, the median lobe strongly depressed in the middle anteriorly; scutellum transversely striated, finely punctured on the sides. Pronotum not produced at the angles; pleuræ irregularly striated, finely and closely punctured below the wings. Dorsal surface of the median segment transversely striated, the surface of the posterior truncation irregularly reticulate, with an almost smooth bell-shaped median area bounded laterally by carinae. Abdomen clavate, a little longer than the head and thorax combined, smooth and shining. Hind coxæ transversely rugose-striate, more coarsely at the apex than at the base; hind metatarsus much longer than the four apical joints combined. First recurrent nervure received by the first cubital cell, the distance between it and the first transverse cubital nervure equal to nearly two-fifths of the length of the recurrent nervure.

*Hab.* Cairns, North Queensland (*F. P. Dodd*).

This large species is easily distinguished by the broad fuscous costal band. The abdomen is more slender and has a longer petiole than in most Australian species of the genus.

*Pristaulacus fulvus*, sp. n.

♀. Fulvo-ochracea; fronte facieque flavis; flagello, fronte macula magna mediana, mandibulis apice, valvulis terebræ, tibiis posticis dimidio apicali, tarsisque posticis nigris; alis flavo-hyalinis, venis fuscis.

Long. 10 mm.; terebræ long. 6 mm.

♀. Head smooth and shining, the front in the middle below the anterior ocellus very finely punctured. Cheeks a little longer than the scape. First joint of the flagellum half as long as the scape, second three times as long as the first, third equal to the first and second combined. Posterior ocelli about half as far again from each other as from the eyes, separated from the eyes by a distance slightly exceeding the length of the first joint of the flagellum. Neck very short; angles of the pronotum not produced; mesonotum coarsely transversely striated, the median lobe deeply impressed in the middle anteriorly; scutellum irregularly transversely striated in the middle, longitudinally striated on the sides. Median segment transversely striated at the base; the surface of the posterior truncation with a few longitudinal carinæ; hind coxæ smooth and shining. Abdomen short, fusiform, narrowed at the base, but without a distinct petiole, smooth and shining. Hind metatarsus longer than the four apical joints combined. First discoidal cell short, the first recurrent nervure received by the first cubital cell close to the middle of its cubital margin.

*Hab.* Kuranda, N. Queensland (*Turner*), February 1902; one female.

This is most nearly allied to the group of *P. flavoguttatus*, Westw., but differs very much in colour from any described species.

*Pristaulacus flavoguttatus*, Westw.

*Anulcus flavoguttatus*, Westw. Trans. Ent. Soc. London, (2) i. p. 223 (1851).

*Pristaulacus flavoguttatus*, Cam. Zeitschr. Hymen. Dipt. iv. p. 191 (1904).

*Pristaulacus flavopictus*, Kieff. Das Tierreich, xxx., Evaniidæ, p. 406 (1912).

*Pristaulacus lateritius*, Shuck.

*Anulcus lateritius*, Shuck. Entomologist, p. 125 (1841).

*Anulcus congener*, Westw. Trans. Ent. Soc. London, p. 267 (1843). ♂.

A male without data in the British Museum is probably the type of *congener*. Shuckard's description seems to refer to the female, though he does not mention the terebra.

LI.—*Contributions to a further Knowledge of the Rhynchotal Family Lygæidæ.* By W. L. DISTANT.*Astacops subochraceus*, sp. n.

Head and pronotum testaceous; the stylated eyes apically black; antennæ black, base of first joint testaceous; scutellum black; corium dull pale purplish, the clavus darker and more nigrescent; membrane glossy black, its apical area pale ochraceous; head beneath pale sanguineous; sternum and abdomen beneath ochraceous, disk of abdomen a little darker and containing a central longitudinal segmental series of mostly transverse black spots; legs black, anterior and intermediate femora—excluding bases—sanguineous; rostrum black; antennæ with the second joint longest, third slightly longer than fourth, which is greyishly pubescent; pronotum with the anterior marginal area transversely broadly carinate, from which a much more slender, central, longitudinal carination extends about midway across pronotum; scutellum strongly transversely carinate near base, and from thence centrally longitudinally carinate to apex; membrane passing the abdominal apex.

Long. 12 mm.

*Hab.* Queensland (*F. P. Dodd*).

Allied to *A. viridiventris*, Stål.

*Scopiastes turneri*, sp. n.

Head reddish ochraceous, apices of the strongly stylated eyes and the apex, or apical area, of the central lobe black; pronotum, broad lateral areas of sternum, scutellum, corium, and membrane black; abdomen beneath pale reddish ochraceous with a broad, sublateral, longitudinal fascia on each side and the apex black; coxæ and femora ochraceous, their apices or apical areas and the tibiæ and tarsi black or blackish; antennæ black or blackish, basal joint—excluding apex—ochraceous, second and third joints longest and subequal in length; eyes very strongly and robustly stylated and a little concavely and upwardly produced; pronotum coarsely and rugulosely punctate; scutellum transversely carinate near base, and thence centrally longitudinally carinate to apex, which is acute; corium thickly finely punctate; membrane about reaching but not passing abdominal apex.

Long. 6–6½ mm.

*Hab.* North Queensland; Kuranda, 1-100 ft. (*R. E. Turner*).

We have also received this species from the same area collected by Mr. F. P. Dodd.

Allied to *S. bicolor*, Dist., and *S. vitticeps*, Horv.

*Scopiastes elegans*, sp. n.

Head testaceous, apices of the stylated eyes black; pronotum testaceous with a broad, central, transverse black fascia, the basal area often strongly tinged with ochraceous; scutellum shining black; corium purplish red, the clavus sometimes much darker; membrane subhyaline, but reflecting the black abdomen beneath; body beneath ochraceous, lateral areas of the pro- and metasterna, and nearly the whole of the mesosternum black; anterior femora testaceous, intermediate and posterior femora black, all the femoral apices ochraceous, fore and intermediate tibiæ dull ochraceous, tarsi and posterior tibiæ black or blackish; antennæ black, base of first joint ochraceous, second, third, and fourth joints almost subequal in length; pronotum with the anterior area transversely, sinuately impressed, the remaining area more or less strongly punctate; scutellum transversely carinate before base, and thence longitudinally carinate to apex; corium thickly but very finely punctate; membrane slightly, but distinctly, passing the abdominal apex.

Long. 8 mm.

*Hab.* North Queensland; Kuranda (*F. P. Dodd*).

*Scopiastes linearis*, sp. n.

Body above (excluding membrane) and body and legs beneath ochraceous; membrane subhyaline and reflecting the dark ochraceous abdomen beneath; apices of the strongly dilated eyes purplish red; antennæ ochraceous, the extreme apices of the joints black, second joint longest, third slightly shorter than fourth; pronotum blackly punctate, a central longitudinal line and two spots near each posterior lateral angle black; scutellum finely, sparsely, blackly punctate, concavely transversely carinate near base, and thence longitudinally carinate to apex; corium with the longitudinal veins more or less black; membrane distinctly passing the abdominal apex; femora distinctly, minutely, blackly punctate.

Long. 4-4½ mm.

*Ann. & Mag. N. Hist.* Ser. 9. Vol. i.

28

*Hab.* North Queensland ; Kuranda, 1-100 ft. (*R. E. Turner*).

We have also received this species, collected in the same habitat, by Mr. F. P. Dodd.

*Oncopeltus vagus*, sp. n.

Ochraceous or testaceous ; head, antennæ, anterior area of pronotum sometimes centrally connected with narrow posterior margin, basal area of scutellum, a somewhat broad central transverse fascia and apical angle to corium, membrane, sternum—excluding basal lateral angles of prosternum and basal margin of metasternum,—about posterior half of abdomen beneath, legs, and rostrum black ; antennæ with the second joint considerably the longest ; pronotum prominently, centrally, longitudinally carinate, the lateral margins broadly recurved ; scutellum centrally longitudinally carinate ; membrane with two white spots, one at basal angle, the other near middle and transverse.

Long. 10-11 mm.

*Hab.* Aru and Admiralty Islds. ('Challenger' Exped.) ; Mysol Isld. (*Wallace*) ; Port Darwin.

Allied to *O. dispar*, Walk., from the Moluccas.

*Oncopeltus consors*, sp. n.

Head and pronotum testaceous ; anterior area and posterior margin of pronotum darker, sometimes black, and also sometimes narrowly centrally connected ; scutellum fuscous, the basal area black ; corium dark ochraceous, with a somewhat narrow, transverse, central fascia and the extreme apical angle black ; membrane piceous, the veins black, and with two small white spots, one at basal angle, the other central ; body beneath testaceous ; trochanters, coxæ, and about apical half of abdomen beneath castaneous, legs black or blackish ; rostrum black ; antennæ black, the second and fourth joints longest and subequal in length ; pronotum centrally, longitudinally, prominently carinate, the lateral margins broadly moderately recurved ; membrane scarcely passing abdominal apex.

Long. 10-11 mm.

*Hab.* Queensland (*F. P. Dodd*).

*Oncopeltus nigroflavatus*, sp. n.

Pale ochraceous ; antennæ, pronotum (excluding posterior



lateral areas), scutellum, a somewhat broad central transverse fascia to corium, membrane, legs (including trochanters and coxæ), rostrum, and apical area of abdomen beneath black; membrane with two white spots, one at basal angle, the other before middle; pronotum broadly contracted at anterior area, centrally longitudinally carinate, the lateral margins broadly recurved; antennæ mutilated, but second joint probably longest, remaining joints absent.

Long.  $11\frac{1}{2}$  mm.

Hab. N. Queensland; Mossman.

*Oncopeltus niloticus*, sp. n.

Stramineous; head, antennæ, about posterior half of pronotum, scutellum, central transverse fascia to corium, membrane, rostrum, legs, lateral margins (more or less) of meso- and metasterna, central and lateral spots to fourth abdominal segment, and almost the whole of apical segment black; a pale greyish spot at base and on disk of membrane; antennæ finely pilose, the second joint longest, fourth very slightly longer than third; head above moderately convex, smooth, almost impunctate; pronotum broadly transversely and longitudinally carinate on anterior half, longitudinally extending into the upper half of the basal black area, the basal margin sinuate, the posterior angles broadly, moderately, posteriorly produced; scutellum moderately, centrally, longitudinally carinate; veins to corium prominent.

Long.  $7\frac{1}{2}$  mm.

Hab. Blue Nile (*E. S. Crespin*).

*Oncopeltus erebus*, sp. n.

Head above, pronotum, and scutellum black, the first with a small testaceous spot at base; corium black, the basal and apical areas fuscous brown; membrane with a small spot at basal angle and a transverse spot before middle greyish white; head beneath testaceous, the lateral and basal areas fuscous; sternum and abdominal margins beneath ochraceous, anterior area of prosternum and basal area of mesosternum testaceous; an oblique lateral fascia on each side of prosternum, anterior area of mesosternum, nearly the whole of metasternum, abdominal segments (excluding margins), rostrum, and legs black; antennæ mutilated; pronotum with a central longitudinal carination not reaching base and crossed before each extremity with a short transverse carinate line, the basal margin somewhat

strongly concave, the lateral angles broadly posteriorly produced; scutellum moderately convex and centrally carinate; lateral margins of head, pronotum and corium, and the legs distinctly pilose; rostrum reaching the posterior coxæ.

Length 14 mm.

*Hab.* Brit. E. Africa; Ngarenarok, Masai Reserve (*Capt. A. O. Luckman*).

*Microspilus sternalis*, sp. n.

Head and pronotum testaceous, the discal area of the latter more ochraceous; scutellum and corium testaceous, the latter with a transverse black fascia behind middle; membrane dark indigo-blue with the veins black, a pale fuscous spot at basal angle and another on basal margin, a small transverse spot on disk of basal area, and narrow apical margin greyish white; body beneath testaceous red, the central areas of the sternal segments dull greyish; apex of abdomen and the legs black; femora (excluding bases and apices) testaceous red; antennæ mutilated; pronotum with the lateral margins sublamine, convex, and moderately upturned; scutellum broadly, coarsely, transversely carinate near base and thence centrally much more narrowly longitudinally carinate to apex; veins to corium very prominent; rostrum reaching the posterior coxæ.

Long. 16 mm.

*Hab.* Madagascar.

*Lygæus lagosensis*, sp. n.

Reddish testaceous; antennæ, extreme apex of head, narrow anterior margin of pronotum from which emerge two angulated lines barely extending to middle, and narrow posterior margin from which emerge two short angular projections, basal margin of scutellum, membrane, antennæ, rostrum, legs, sternal segmental margins, and apical abdominal segment black or blackish; antennæ somewhat robust, second joint longest; scutellum robustly, globosely, transversely carinate at basal margin and then robustly, broadly, longitudinally carinate to apex; veins to corium very robust; rostrum about reaching posterior coxæ.

Length 13 mm.

*Hab.* Lagos (Hinterland) (*J. W. Rowland*).

Allied to *L. furcatus*, Fabr.

*Lygæus tonkinensis*, sp. n.

Head above sanguineous, eyes, a broad basal maculation gradually attenuated anteriorly and reaching apex, and the antennæ black; pronotum and corium pale testaceous, inclining to violaceous; two large basal pronotal spots, almost meeting centrally and scarcely separated from the lateral margins, scutellum (excluding central carination), a somewhat oblongly rounded spot just before the apical incisure of clavus, a much larger spot near middle of corium, which is rounded inwardly and truncated at lateral margin of corium, and the membrane black, apical margin of the latter greyish white; body beneath dark testaceous; legs, rostrum, antennæ, and apical abdominal segments black; basal joint of rostrum testaceous and basal joint of antennæ somewhat of that colour; second joint of antennæ much the longest, third a little shorter than fourth; pronotum moderately transversely and longitudinally carinate, scutellum longitudinally carinate; rostrum about reaching the posterior coxæ.

Long 8-9 mm.

*Hab.* Indo-China; Tonkin, Ban Son Moi (*R. Vitalis de Salvaza*).

Allied to *L. melanospiloides*, Montand., *L. autolytus*, Dist., and *L. fimbriatus*, Wall., and belonging to the subgenus *Tropidothorax*, Berg., n. n. = *Melanospilus*, Stål, nom. præocc.

*Graptostethus inornatus*, sp. n.

Reddish ochraceous or testaceous; apex of head, a basal spot contiguous to eyes, a central transverse fascia on anterior area of pronotum not nearly reaching the lateral margins shortly posteriorly attached to two discal rotundate spots, scutellum, membrane, body beneath, legs, rostrum, and antennæ black; posterior margins of corium and posterior margins of sternal segments ochraceous; body beneath and legs finely greyish pilose, the posterior abdominal segmental margins narrowly obscurely ochraceous, the lateral sternal areas with prominent dark black spots, lateral margins of sternum and abdomen beneath testaceous; second joint of antennæ longer than third; pronotum centrally, faintly, longitudinally carinate; scutellum broadly and coarsely basally and centrally carinate; membrane slightly passing the abdominal apex and with its

apical margin greyish white ; rostrum reaching the posterior coxæ.

Long. 8 mm.

*Hab.* Malay Archipelago ; Andai (*W. Doherty*). Batchian (*Wallace*).

*Graptostethus parvinotatus*, sp. n.

Testaceous ; central longitudinal fascia to head, eyes, two oblique transverse incisures on anterior area of pronotum followed by four small discal spots in two transverse series, corium with the outer claval margin and two elongate discal spots in oblique series on disk, membrane, prominent lateral spots on sternal segments, rostrum, and antennæ black ; legs fuscous, thickly pilose ; antennæ with the second joint considerably longest ; scutellum not rugosely carinate ; apical margin of corium narrowly faintly ochraceous ; rostrum about reaching or very slightly passing the posterior coxæ ; body beneath distinctly, finely, thickly pilose, the apical segments more or less suffused with black.

Long 9 mm.

*Hab.* Siamese Malay States ; Biserat (*Annandale and Robinson*).

*Graptostethus parvus*, sp. n.

Head, pronotum, scutellum, and corium ochraceous ; a broad central longitudinal fascia to head, two broad discal longitudinal fasciæ connected with a similar transverse anterior fascia to pronotum, two large contiguous basal spots to scutellum, interior claval margin and a submarginal elongate spot on posterior half of corium and extreme apical margin of same, large lateral spots to sternal segments, antennæ, rostrum, and legs black ; abdomen above sanguineous, its apex black ; antennæ with the second joint distinctly longer than the third, but scarcely longer than the fourth ; pronotum and scutellum distinctly somewhat coarsely punctate ; scutellum centrally longitudinally carinate ; legs thickly pilose ; abdomen beneath finely, somewhat obscurely pilose, its apical segments more or less suffused with black ; rostrum about reaching posterior coxæ.

Long. 6 mm.

*Hab.* Queensland ; Townsville (*F. P. Dodd*).

Allied to *G. cardinalis*, Stål.

*Graptostethus electus*, sp. n.

Sanguineous ; head with apex of central lobe and a basal spot contiguous to eyes, pronotum with a broad, anterior, transverse fascia connected with two broad, longitudinal, sublateral fasciæ reaching base, basal margin of scutellum ; clavus connected with a small outer longitudinal spot at base and with a transverse fascia at its apex, which is continued along lateral margin of corium to apex black ; antennæ, rostrum, sternum (excluding lateral margins), legs, and apex of abdomen beneath black ; anterior and intermediate femora (excluding bases) sanguineous ; antennæ with the second, third, and fourth joints almost subequal in length, second slightly the longest ; pronotum distinctly, centrally, longitudinally carinate on about posterior two-thirds ; scutellum transversely rugosely carinate at base, thence more finely longitudinally carinate to apex ; corium with the veins moderately prominent ; membrane greyish white, black at base, distinctly passing abdominal apex ; rostrum reaching posterior coxæ.

Long. 9–10 mm.

*Hab.* Brit. East Africa ; Voi, 1800 ft., Simba, 3350 ft., West Slopes of Kenya, on Meru Nyeri Rd. (*S. A. Neave*). 30 miles from Magadi Junc. (*F. G. Hamilton*). Nairobi (*Dr. A. D. Milne*).

*Graptostethus grandis*.

*Graptostethus grandis*, Dist. Ann. & Mag. Nat. Hist. (7) vii. p. 537 (1901).

This species proves to be of a slightly variable character ; the scutellum is in some specimens totally black and the outer margins of clavus also of that colour. The abdomen beneath in some varieties is almost wholly black.

*Hab.* Nyasaland, Fort Johnson (*P. Rendall*) ; Mlanje (*S. A. Neave*). Congo Free State, Kanibove, Katanga (*S. A. Neave*). Uganda, Entebbe, and Buamba Forest, Semliki Valley (*S. A. Neave*).

*Graptostethus rufus*, sp. n.

Reddish ochraceous ; apex of head, anterior margin and two small spots on anterior area of pronotum, basal margin of scutellum, membrane black ; body beneath, legs, rostrum, and antennæ black ; lateral margins of head, sternum, and abdomen reddish ochraceous ; sternal segmental transverse margins and coxal spots greyish white ; abdomen beneath

more or less suffused with reddish ochraceous and the abdominal segmental margins very narrowly of that colour; a pale fuscous spot at base of membrane; second and fourth joints of antennæ longest and subequal in length, each distinctly longer than third; pronotum very indistinctly longitudinally carinate; membrane scarcely or very slightly extending beyond abdominal apex.

Long. 10-12 mm.

*Hab.* Uganda Prot. (*C. C. Gowdey*), Buamba Forest, Semiliki Valley, 2300-2800 ft., Mpaanga Forest, Toro, 4800 ft., and Daro or Durro Forest, Toro, 4000 to 4500 ft. (*S. A. Neave*).

In some varieties the anterior black margin of the pronotum is much enlarged and extends to and absorbs the two small anterior spots, in other specimens again these pronotal spots are entirely absent.

\* [The types and other specimens described or referred to in this paper are all contained in the British Museum.]

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LII.—*Two new Diptera from Trinidad.*

By F. W. EDWARDS.

THE two species diagnosed below were sent me for determination by Mr. C. B. Williams, who, in company with Mr. F. W. Ulrich, collected them at Guacharo cave, Trinidad—the *Trichobius* on an undetermined bat, the Tipulid on the walls of the cave. Co-types of the former and the type of the latter have been presented by the collectors to the British Museum; further reference to them will be made in their forthcoming paper on the cave fauna.

*Trichobius cæcus*, sp. n.

Eye-spot unfacetted. Mesonotum uniformly covered with rather short bristles, those on the front margin not longer than the rest. Scutellum with four long bristles. Longitudinal suture of the mesonotum short, bifurcated behind, extending barely one-third of the distance from the front margin to the transverse suture. Anterior angle of metasternum about 95°.

Length 1.8 mm.

According to specimens in the British Museum from Basin

Well, Dominica (host, *Vespertilio nigricans*), *Trichobius parasiticus*, Gerv., differs as follows from the new species:—Eye-spot with about eight distinct facets. Mesonotum with two rows of long bristles in front, remainder with minute bristles which are less numerous and smaller than those of *T. cæcus*; several moderately long ones just before the scutellum. Longitudinal suture not bifurcated, extending nearly two-thirds of the distance from the front margin to the transverse suture. Anterior angle of metasternum more obtuse. Length 2.2 mm.

I consider it doubtful, however, whether the Dominican specimens are correctly identified, since both they and the Trinidad species have the front femora much less swollen than is indicated by Gervais for *T. parasiticus* and Kolenati for *Strebla wiedemanni*. Neither of these forms shows the emargination of the wing-tip, given by Speiser as a character of *T. parasiticus*.

*Erioptera troglodyta*, sp. n.

*Head* dark brown; antennæ and palpi blackish; a white spot on the front just above the base of the antennæ. *Thorax*: mesonotum rather light brownish, somewhat darker towards the margins, but without distinct stripes. *Pleuræ* light



*Erioptera troglodyta*, ♂ genitalia.

yellowish; one broad dark brown stripe across the middle; sternopleura also dark brown. *Abdomen* blackish. Male genitalia as figured. *Legs* ochreous brown; femora with the tips almost white and with a dark brown subapical ring. *Wings* entirely unmarked; venation as in *E. immaculata*, Alex.; wing-length 3 mm.

Allied to *E. immaculata*, Alex., but the coloration of the thorax is quite different. Alexander placed *E. immaculata* in the subgenus *Mesocyphona*, but according to Osten-Sacken's definition both it and the new species are typical *Erioptera*.

LIII.—On some External Characters of Ruminant Artiodactyla.—Part I. The Cephalophinæ, Neotraginæ, Oreotraginæ, and Madoquinæ. By R. I. POCK, F.R.S.

IN 1910 (Proc. Zool. Soc. pp. 840–986) I described the specialized cutaneous glands and some other external characters of Ruminants. The account was based upon the facts recorded by previous workers, upon the *post mortem* examination of specimens that had died in the Zoological Society's Gardens and upon dried skins in the collection of the British Museum or in the possession of Messrs. Rowland Ward, Ltd., and of Mr. E. Gerrard, who kindly helped me with material. Since that time I have had the opportunity of seeing many additional specimens, some belonging to species previously examined, others to species, and in some cases to genera, which were not available for inspection in 1910. Most of the additional specimens were fresh individuals that had been exhibited in the Zoological Gardens up to the time of their death, but several of them were brought to me, at my special request, from British East Africa by the late Mr. F. C. Selous on his return from his last hunting-trip to that country before the outbreak of war.

All this extra material has enabled me to confirm and amplify my previous records, and in some cases to correct a few of the statements with regard to the structure of the pedal glands, which were based upon what has proved to be defective material in the form of feet supplied by Messrs. Rowland Ward and Gerrard.

In a series of short papers to be published in the course of the current year in the 'Annals,' I propose to embody the facts noted since 1910 as supplementary to the account issued in that year; and to facilitate reference I have inserted after each species or genus cited the page of my paper in the 'Proceedings of the Zoological Society' where the species may be found.

Subfamily CEPHALOPHINÆ.

Genus GUEVEI, Gray (p. 867).

*Guevei monticola*, Thunb.

I had not seen this species in 1910. It is of special interest, because of Ogilby's statement that the pedal glands



are absent. In 1910 I assumed, from the analogy supplied by *G. maxwelli*, *G. melanorheus*, and *G. æquatorialis*, that Ogilby was wrong in this particular, and a fresh example from South Africa, received in 1912, completely justified this assumption. The glands in question are present on both fore and hind feet, and resemble tolerably closely in structure those of *G. æquatorialis*, which I described from dried feet.

It may be recalled that in each of the three species of *Guevei* described in 1910 the pedal glands differed to a certain extent. In *G. maxwelli* the inner or proximal end of the deep sack is dilated between the bones of the digits, so as to reach almost from the posterior to the anterior integument of the pastern, the orifice of the narrower tubular portion being somewhat expanded (fig. 92, p. 869). In *G. æquatorialis* and *G. melanorheus* (fig. 93, p. 871), on the contrary, there is no inner or proximal dilatation of the sack. In *G. melanorheus*, moreover, the lumen of the sack is almost cylindrical in longitudinal section, the orifice being scarcely expanded, whereas in *G. equatorialis* the sack expands tolerably evenly from its proximal end to its orifice, which is greatly dilated. The gland is similarly expanded in *G. monticola*, but it is relatively rather shorter than in *G. æquatorialis* and has the walls less hairy.

For the shape of the rhinarium in *G. maxwelli* see fig. C.

### Genus CEPHALOPHUS, H. Sm.

#### *Cephalophus dorsalis*, Gray (p. 871).

An adult male example from Obuassi in Ashanti agrees in its characters with the description of the specimen from Sekondi.

The preorbital gland was of immense size and exuded from its serially arranged pores a sugary sweet-smelling secretion.

The inguinal gland was set far out on each side close to the knee-joint. From its thick-lipped orifice the sack ran obliquely forwards and inwards for a couple of inches under the flap of skin that ties the knee to the abdomen. The secretion was brown and waxy, with a strong unpleasant smell.

The secretion of the pedal glands was like cream-cheese in appearance and odour.

The penis terminated in a downwardly bent expansion, with the orifice of the urethra opening near the middle of its

left side, and thus behind the tip of the penis. The point to notice is that the end of the urethral canal is not prolonged as a special tubular process beyond the glans, whereas according to Garrod this canal is produced in *Guevei maxwelli* and *monticola* into a long almost filiform termination, recalling that of the sheep and goats, the shape of the glans otherwise being as in *Cephalophus* (Proc. Zool. Soc. 1877, p. 10, fig. 20).

Genus SYLVICAPRA, Ogilby.

*Sylvicapra coronata*, Gray (p. 873).

The description and figure of the inguinal glands of this species published in 1910 were taken from immature male specimens from various parts of Nigeria. They were stated to be wide shallow pits, much shallower than the corresponding glands of *Cephalophus dorsalis*.

In an adult female of the same species from Nigeria (W. A. Clayton) I found the gland to consist not of a definite and deep pocket, as in *Cephalophus*, but of a long, oblique, gutter-like depression of the integument overlapped by a flap of skin in front.

I find nothing to add to my description of the preorbital and pedal glands.

*Sylvicapra grimmia*, Linn.

Of this species I was able to describe only the pedal glands in 1910.

The inguinal glands in three examples subsequently received from various parts of South Africa had inguinal glands like those of *S. coronata* described above—that is to say, each gland consisted of a gutter-like groove lying in the angle formed by the junction of the femur and the abdomen. In one specimen, a female, the ends of the groove were overlapped by a small flap of skin forming a very shallow pocket.

From the material available it appears that the inguinal glands of *Sylvicapra* differ very markedly from those of *Cephalophus*, where they consist of deep narrow pockets.

A further difference between the genera, apart from that supplied by the direction of the horns, is to be found in the penis. In a male of *Sylvicapra grimmia* the extremity of the penis was much less expanded than in the example of *Cephalophus dorsalis* described above, and the urethral canal was prolonged by a slender tubular process beyond the tip of the glands, recalling the similar process found in many antelopes and other Bovine Ruminants.

In view of the above-recorded facts, the tabulation of the genera of Cephalophinæ I published in 1910 (p. 876) may be amplified as follows :—

- a.* Inguinal glands absent ..... *Guevei.*
- a'.* Inguinal glands present.
- b.* Inguinal glands consisting of a deep pocket; urethral canal not prolonged as a slender tube beyond the tip of the glans of the penis; horns backwardly inclined ..... *Cephalophus.*
- b'.* Inguinal glands consisting of a very shallow pocket or gutter-like groove; urethral canal prolonged as a slender tube beyond the end of the glans of the penis; horns approaching the vertical ..... *Sylvicapra.*

To the characters of the subfamily Cephalophinæ must be added the absence of the gall-bladder in the liver. I have failed to find a trace of this structure in any one of the many examples of this group I have examined, thus confirming the statements of others as to the invariable absence of this hepatic sack.

#### Subfamily NEOTRAGINÆ.

Of this subfamily I had only seen in 1910 representatives of two genera and species, namely *Ourebia nigricaudata* and *Raphicerus campestris*, my acquaintance with the latter being limited to two dried and mounted skins. Since then I have seen fresh examples of two additional species of *Ourebia* and of the two genera *Nototragus* and *Neotragus*. The two species of *Ourebia* agree in all essential points with the one previously described, and *Nototragus* similarly resembles *Raphicerus*, as might be expected. But *Neotragus* is in many respects different from the other genera referred to the Neotraginæ; and if subsequent examination of the species supposed to be related to *Neotragus*, but assigned to the genera or subgenera *Hylarnus* and *Nesotragus*, shows that they are like *Neotragus pygmaeus* in the pedal glands, it may be desirable to sever *Ourebia*, *Raphicerus*, and *Nototragus* from the Neotraginæ as a separate subfamily, Ourebiinæ.

#### Genus OUREBIA, Laurill.

*Ourebia nigricaudata*, Brooke (p. 882).

A subadult male of this species from Sierra Leone (*F. W. F. Jackson*) agreed closely with the specimen described in 1910 in the structure of the pedal and preorbital glands, the secretion from the latter being copious and black. The carpal

glands, set more towards the inner side of the leg than in gazelles, were covered for the most part with white hairs stained with yellow secretion at the base. The inguinal glands, however, were not or scarcely invaginated, being represented by a thick tuft of longish hairs arising from a thickened area of skin close to the scrotum and covered with an abundance of yellow powdery secretion. Although there was no definite pocket, these glandular hairy areas had the appearance of being capable of invagination, and thus of reproducing the condition of pockets with protruding hair described and figured in this species in 1910.

*Ourebia montana*, Cretzsch.

A female example of this species from the Soudan (*G. Blaine*) agreed with *O. nigricaudata* in every particular so far as the cutaneous glands were concerned, the inguinal glands being definite pouches filled with hair protruding from the orifice.

*Ourebia ourebi*, Zimm.

No example of this South-African species had been seen when I wrote my paper in 1910.

A young male that died in the Gardens in 1911 agreed in the structure of its preorbital, carpal, and pedal glands with *O. nigricaudata*. As in *O. nigricaudata*, the bare patch below the ear showed no sign of being glandular; but each inguinal gland consisted of a very large mat of rather coarse white hair holding a quantity of powdery secretion smelling like "cold cream" ointment. The skin beneath the hair was pale-coloured and not invaginated. The surrounding skin, as far out as the inner side of the thighs and as far forwards as the penis, was naked and lead-coloured.

A remarkable difference between this species and *O. nigricaudata* was the arrangement of the four mammae in a transverse line in front of the scrotum. In *O. nigricaudata* the mammae form a quadrate figure wider in front than behind.

The interesting points for future confirmation or refutation connected with these species of oribi may be tabulated as follows:—

- |     |   |  |
|-----|---|--|
| a.  | Inguinal glands represented by a great tuft of uninvaginated hair on each side; the four mammae arranged in a transverse line.          | <i>ourebi</i> .                        |
| a'. | Inguinal glands represented by a smaller tuft of partially invaginated hair on each side; arrangement of mammae quadrilateral . . . . . | <i>nigricaudata</i> & <i>montana</i> . |

Genus NOTOTRAGUS, Thomas & Schwann.

*Nototragus melanotis*, Thunb. (p. 182).

I had not seen this species in 1910, but since that date two examples—an immature female and an adult male—have come into my hands.

The pedal and preorbital glands were like those of *Raphicerus campestris* described from dried skins in 1910 (pp. 879–880, fig. 98). According to Owen inguinal glands are present, but there was no trace of them in either of the two above-mentioned specimens. As in *Ourebia*, the whole of the inguinal area, involving the penis, scrotum, and part of the thighs, was bare, and the four teats were arranged in a transverse line, as in *Ourebia ourebi*, with this difference, that, whereas in the oribi the median, morphologically the posterior, mammae were much more widely separated from each other than either was from the adjacent exterior (anterior) mamma, in the grysbok the reverse was the case, the two medians being closely juxtaposed.

An interesting discovery in the case of the male was the presence of a well-developed preputial gland recalling that of *Moschus* (P. Z. S. 1916, p. 749, fig. 6). Whether this gland is present or not in *Raphicerus* and *Ourebia* has yet to be ascertained.

Genus NEOTRAGUS, H. Smith.

*Neotragus pygmaeus*, Linn.

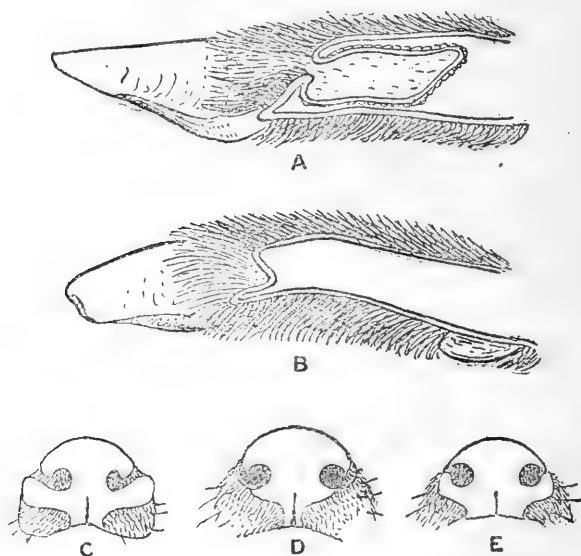
In 1910 I was unable to give any particulars about the cutaneous glands of the genus *Neotragus*; nor does it appear that any previous author has described them\*. A young female specimen from Accra, which died in the Gardens in 1912, was therefore of considerable interest.

The preorbital gland was a circular area of considerable size, rising slightly above the general level of the skin of the face, and covered with very short hair. In the centre of the glandular area there was a cluster of pores, from which a gummy secretion without any particular odour could be pressed. But there was no invagination of the secreting surface to form a pocket or reservoir for the substance.

The rhinarium was large and moist, extending dorsally as

\* In 1910 (p. 867) I gave reasons for concluding that the antelopes cited by Owen and Ogilby under the specific name *pygmaeus* belonged to the genus *Guere*i of the subfamily Cephalophinae.

far back as a line joining the posterior angle of the nostrils. There was a tolerably deep infranarial tract on each side, and the inferior extension of the rhinarium to the edge of the upper lip in front was wide—a little wider, indeed, than the space between the nostrils just above it. It was marked below by a short median groove not reaching upwards to the level of the nostrils (fig. E).



- A. Section of hind foot of *Neotragus pygmaeus*.  
 B. The same of *Oreotragus oreotragus*.  
 C. Rhinarium of *Guevei maxwelli*.  
 D. „ *Nototragus melanotis*.  
 E. „ *Neotragus pygmaeus*.

The false hoofs were absent, but were represented by small naked protuberances of soft uncornified skin\*.

The absence of a pouch connected with the preorbital gland shows this gland to be of a more primitive type than that of

\* It may be interesting to record in connection with this specimen that there was a minute canine in the upper jaw and a canine-like cornified papilla on the gum of the lower jaw; that the liver was provided with a small gall-bladder and the psalterium was furnished with only seven primary laminae—one in the middle and three on each side,—all depending from the roof to the floor of the cavity, no trace of the ordinary secondary and tertiary laminae being discernible. This was the simplest type of psalterium I have seen in any Ruminant.

*Ourebia*, *Raphicerus*, and other genera referred to the Neotraginæ, and serves to connect the latter in a measure with the Cephalophinæ. In the Cephalophinæ, however, the row of secreting pores is arranged in a definite longitudinal series forming a streak upon the face. Probably in *Neotragus* the gland represents an earlier stage in the evolution of the gland both in the Cephalophinæ and the other genera of the Neotraginæ. The relatively greater size of the rhinarium also, in my opinion, marks *Neotragus* as more primitive than *Ourebia* or *Raphicerus*, and brings it into line with the Cephalophinæ. In a measure also the pedal glands of *Neotragus* serve to link the Cephalophinæ with *Ourebia* and *Raphicerus*.

There was no trace of inguinal glands, and there were two pairs of mammæ.

The pedal glands were well and equally developed on both front and hind feet. Each gland consisted of a capacious and deep pouch occupying the greater part of the space between the phalanges and opening into the hairy interdigital space by a small circular orifice, the lower rim of which was formed by the upturned edge of the fold of integument tying the heels together, and the upper rim by the closely folded integument of the front of the pastern. Thus the orifice was set higher up within the interdigital space than in the Cephalophines, and in *Madoqua* and *Dorcotragus*. The sack of the gland was sparsely hairy; the interdigital space was covered with long hairs, but the inferior apex of the triangular heel-tie was naked as in the Cephalophines (fig. A).

The genera of this subfamily known to me may be distinguished by their cutaneous glands and other external features as follows:—

- |   |                     |
|---|---------------------|
| a. Pedal glands opening into the interdigital space by a small circular orifice; no invagination of the surface of the preorbital gland ..... | <i>Neotragus</i> .  |
| b. Pedal glands opening into the interdigital space by a long cleft; surface of the preorbital gland invaginated.                             |                     |
| a'. Pedal glands overlapped in front and above by a long fold of integument; no inguinal glands.  |                     |
| a <sup>2</sup> . False hoofs absent .....   | <i>Raphicerus</i> . |
| b <sup>2</sup> . False hoofs present .....  | <i>Nototragus</i> . |
| b'. Pedal glands an open cleft not overlapped in front above by a fold of integument; inguinal glands present .....                           | <i>Ourebia</i> .    |

Subfamily *OREOTRAGINÆ*.Genus *OREOTRAGUS*, H. Sm.*Oreotragus oreotragus*, Zimm.

In 1910 the only material of this species available for examination was a single foot with the bones of the pastern cut away from behind. A fresh specimen that has since come into my hands has shown that my description of the foot was wrong in one important point. I am now able to correct this, and to add some particulars about other glands.

The preorbital gland was visible externally as a small shallow pouch with a circular orifice opening in the centre of a sparsely hairy area of skin a little way in front of the anterior angle of the eye. The gland itself consisted of a thick solid mass of black tissue, the secretion of which, smelling like the perfume of *Viverra*, was discharged through four large pores opening at the bottom of the shallow pouch.

The published evidence as to the existence of inguinal glands in this antelope is contradictory, Hamilton Smith affirming, Owen denying, their presence. There was no trace of them in the specimen I examined. There were two pairs of mammae.

A peculiarity of the klipspringer is its habit of standing upon the truncated ends of the hoofs, and not upon the sole and heel of the foot like all other Ruminants, whatever the nature of the ground they inhabit. The interdigital space above the hoofs is tolerably long and deep and lined with long hair, but is not apparently glandular. In longitudinal section it is nearly rectangular in shape, the heel-tie being short and formed of a close fold of skin which is everywhere covered with long hair and neither thickened nor upturned at its distal or lower extremity. The fore and hind feet are alike in structure (fig. B).

The rhinarium or muffle is naked above as far back as a line joining the posterior extremities of the nostrils. On the sides of the upper lip the hairs extend up to the inferior edge of the nostrils and forwards towards the middle line, narrowing the lower part of the rhinarium almost as in *Ourebia* and *Nototragus* (fig. D).

The status of the subfamily *Oreotraginæ* is not, in my opinion, affected by the corrected information we now possess of the structure of the interdigital spaces.



Subfamily *MADOQUINÆ*.Genus *MADOQUA*, Ogilby.

An example of *M. kirki* from British East Africa (*F. C. Selous*) agrees with the specimen of *M. phillipsii* described by me in 1910 in the structure of the pedal glands and the absence of inguinal glands. There were two pairs of mammæ.

The Madoquinæ (*Madoqua* and *Dorcotragus*) differ from the other antelopes considered in this paper by the structure of the muzzle and rhinarium.

## PROCEEDINGS OF LEARNED SOCIETIES.

## GEOLOGICAL SOCIETY.

April 17th, 1918.—Mr. G. W. Lamplugh, F.R.S.,  
President, in the Chair.

The following communication was read:—

‘The Evolution of the Liparoceratidæ.’ By Arthur Elijah  
Trueman, M.Sc., F.G.S.

The Ammonites considered include several sub-parallel series, of which four genera were indicated by Mr. S. S. Buckman in ‘Yorkshire Type Ammonites.’ The details of ontogeny and the sutures, which had not hitherto been compared, have been employed in constructing tables showing both the biological and the stratigraphical relations of the various species; a revision of the existing classification is proposed.

The early members of each series are similar ‘capricorn’ forms with slender whorls and stout ribs (for instance, *A. capricornus*, *A. latacosta*, *A. maculatus*). In somewhat later examples the outer whorl is swollen, and has paired tubercles (for instance, *A. heterogenes*). From this stage the tendency is to shorten the period with slender capricorn whorls by accelerating the development of bituberculation and prolonging the period of pre-costate globose whorls; thus the most advanced members of each series are stout bituberculate forms (for instance, *A. striatus*, *A. bechei*), which do not pass in development through a capricorn stage.

The following genera may be recognized; each includes ammonites of the three types mentioned above:—

1. An earlier group, with tubercles paired in the involute stages; Radstock (Somerset) is the only British locality where these ammonites have been found.

*Parinodicerus*, gen. nov. Elevated whorl, paired tubercles, the inner and outer rows widely separated. Genoholotype, *Ammonites striatus parinodus* Quenstedt (1881, pl. xxviii, fig. 6).

Gen. nov. Round whorl, with the rows of tubercles placed close together. Genoholotype, a specimen to be figured as a new species.

2. A later group, with unpaired tubercles in the involute stage. These genera are most readily distinguished by sutural characters, namely, the relative depths of the external lobe (EL) and the first lateral lobe (IL), and by the width of the external saddle (ES).

(a) With narrow ES (not reaching to the outer tubercles).

*Liparoceras* Hyatt. IL and EL about equal in depth. Genoelectotype, *Ammonites striatus* Bronn.

*Becheiceras*, gen. nov. IL deeper than EL. Genoholotype, *Ammonites bechei* Wright. ('Lias Ammonites' pl. xli, fig. 1.)

*Anisoloceras*, gen. nov. IL much deeper than EL, the ventral lobules of IL almost meeting under EL. Genoholotype, *Ammonites nautiliformis* J. Buckman.

(b) With wide ES, reaching to the outer tubercles.

*Ægoceras* Waagen. EL and IL about equal in depth, IL symmetrical. Genoelectotype, *Ammonites planicosta* d'Orbigny.

*Androgynoceras* Hyatt. IL and EL about equal in depth, IL asymmetrical. Genoelectotype, *Ammonites hybrida* d'Orbigny.

*Oistoceras* S. S. Buckman. Ribs with sharp peripheral curve. Suture similar to *Androgynoceras*. Genoholotype, *Ammonites figulinus* Simpson.

*Amblyoceras* Hyatt. Ribs with slight peripheral curve. IL shallower than EL. Genoholotype, *A. capricornus* Hyatt, 1900.

These ammonites generally occur in the upper part of the Lower Lias, where it has been usual to recognize a *capricornus* zone overlying a *striatus* zone. Careful collecting has shown, however, that there are several horizons with capricorn ammonites of different series and several with the involute forms evolved from them, as shown below:—

<i>margaritatus</i> zone.	{ Bituberculate ammonites of the <i>A. nautiliformis</i> series.		
	Bituberculate	" "	<i>Oistoceras</i> .
	Capricorn	" "	<i>Oistoceras</i> .
<i>davæi</i> zone .....	Bituberculate	" "	the <i>A. bechei</i> series.
	Bituberculate	" "	<i>Ægoceras</i> & <i>Androgynoceras</i> .
	Capricorn	" "	<i>Amblyoceras</i> .
	Capricorn	" "	<i>Ægoceras</i> , <i>Androgynoceras</i> .
	Capricorn	" "	<i>Beaniceras</i> .
<i>ibex</i> zone .....	Bituberculate	" "	<i>Liparoceras</i> .
	Capricorn	" "	<i>Liparoceras</i> .
	Bituberculate	" "	the first group (with paired tubercles).

In no locality that has been examined is the complete sequence shown. The absence of some groups is due to the original distribution of the ammonites; in other cases it is due to non-sequences (for example, the upper part of the *davæi* zone is not represented in Gloucestershire).

Two groups of Lias Ammonites are recognized, namely: (i) those which were evolved directly from a globose ancestor; this includes the *Liparoceratidæ*, *Echioceratidæ*, *Hildoceratidæ*, *Poly-morphidæ*, *Deroceratidæ*; and (ii) those which passed through an intermediate broad-ventered (cadicone) stage; these include the *Amaltheidæ* and *Dactyloidæ* (with *Beaniceras*).

# INDEX to VOL. I.

---

- ACANTHODORYCTES**, characters of the new genus, 55.  
**Æthechinus**, characters of the new genus, 194, 230.  
**Aganais**, new species of, 316.  
**Akodon**, new species of, 188.  
**Alectryon**, new species of, 139.  
**Amatidæ**, new, 325.  
**Amphithalamus**, new species of, 147.  
**Andrena**, new species of, 165.  
**Anisodes**, new species of, 314.  
**Anomæoceros**, characters of the new genus, 397.  
**Antedon**, on the anal plate in, 294.  
**Antitrygodes**, new species of, 27.  
**Aprimetopsis**, new species of, 330.  
**Asilidæ** from Australia, notes on, 57.  
**Aspidomorpha**, new species of, 322.  
**Astacops**, new species of, 416.  
**Atelerix**, new species of, 231.  
**Athesis**, new species of, 77.  
**Bagnall, R. S.**, on new *Thysanoptera*, 201.  
**Bather, Dr. F. A.**, on *Protoëchinus*, 40; on the homologies of the anal plate in *Antedon*, 294.  
**Batrachians**, notes on, 236, 372.  
**Bibliographical notice**, 327.  
**Biróia**, new species of, 229.  
**Boulenger, G. A.**, on species of the genus *Rana*, 236; on the batrachian genera *Cornufer*, *Platymantis*, &c., 372.  
**Brachydesmus**, a peculiar state of development in, 281.  
**Braconidæ**, notes on, 49, 221.  
**Braunsia**, new species of, 224.  
**Brölemann, H. W.**, on a peculiar state of development in *Brachydesmus*, 281.  
**Bursa**, new species of, 138.  
**Callistia**, new species of, 32.  
**Callithomia**, new species of, 81.  
**Callomelitta**, new species of, 164.  
**Calman, Dr. W. T.**, on barnacles of the genus *Scalpellum*, 96; on a new river-crab from the Transvaal, 234; on the type-specimens of *Pœcilasma carinatum*, 401.  
**Cardiophiles**, new species of, 49.  
**Carditella**, new species of, 157.  
**Cassidineæ**, new, 322.  
**Ceratotheripoides**, characters of the new genus, 201.  
**Cerceris**, new species of, 91.  
**Cerdistus**, new species of, 62.  
**Cerdocyon**, new species of, 371.  
**Cestoplectus**, characters of the new genus, 390.  
**Chalcidoptera**, new species of, 127.  
**Chalcosphærium**, new species of, 173.  
**Champion, G. C.**, on *Coleoptera* from the Falkland Islands, 167.  
**Chlorion**, new species of, 358.  
**Chloropidæ**, new, 329, 385.  
**Cingulina**, new species of, 146.  
**Cleora**, new species of, 32.  
**Cockerell, T. D. A.**, descriptions and records of bees, 158.  
**Coleoptera**, new, 1, 167, 245.  
**Colletes**, new species of, 159.  
**Comibæna**, new species of, 19.  
**Cosymbia**, new species of, 25.  
**Craspedosis**, new species of, 316.  
**Cremnops**, new species of, 222.  
**Crinophora**, characters of the new genus, 325.  
**Crozier, Miss B. B.**, on Bermudian species of *Donatia* (*Tethya*), 11.  
**Cryptochilus**, new species of, 351.  
**Cryptosalius**, new species of, 354.  
**Cryptothrips**, new species of, 216.  
**Ctenomys**, new species of, 38.  
**Curculionidæ**, new species of, 1, 245.  
**Cylichna**, new species of, 154.  
**Cylindrobaris**, characters of the new genus, 8.  
**Cylindrobulla**, new species of, 155.  
**Cyphononyx**, new species of, 349.  
**Cypriocardia**, new species of, 157.  
**Dactylispa xanthopus**, on variation in the prothoracic spines of, 70.  
**Deiradognathus**, characters of the new genus, 4.

- Demodecidæ, remarks on, 400.  
 Dentalium, new species of, 155.  
 Dichocrocis, new species of, 131.  
 Dichogama, new species of, 127.  
 Diptera, new, 424.  
 Disophrys, new species of, 225.  
 Distant, W. L., on homoptera from Indo-China, 196; contributions to a further knowledge of the rhynchotal family Lygæidæ, 416.  
 Divaricella, new species of, 156.  
 Donatia, on Bermudian species of, 11.  
 Edwards, F. W., on two new diptera from Trinidad, 424.  
 Eidothrips, characters of the new genus, 219.  
 Elachiptera, new species of, 386.  
 Elis, new species of, 86.  
 Epeolus, new species of, 160.  
 Epimadiza, new species of, 346.  
 Epipagis, new species of, 277.  
 Epistictia reichiana, note on, 74.  
 Erioptera, new species of, 425.  
 Eterusia, new species of, 312.  
 Euchelus, new species of, 154.  
 Eulimella, new species of, 145.  
 Eurhynchothrips, characters of the new genus, 213.  
 Euryglossa, new species of, 164.  
 Falklandius, new species of, 184.  
 Filodes, new species of, 127.  
 Flavinia, new species of, 31.  
 Fœnus, new species of, 413.  
 Fossarus, new species of, 148.  
 Fulgora, new species of, 198.  
 Furcivena, new species of, 276.  
 Gampsocera, new variety of, 390.  
 Geological Society, proceedings of the, 262, 435.  
 Graomys, new species of, 187.  
 Graptostethus, new species of, 421.  
 Hamalia, new species of, 26.  
 Hampson, Sir G. F., on new Pyralidæ of the subfamily Pyraustinae, 125, 252, 265.  
 Haplothrips, new species of, 208.  
 Haversia, characters of the new genus, 185.  
 Hemipepis, new species of, 285.  
 Heterocera, new, 312.  
 Heterorachis, new species of, 314.  
 Heteroscinis, characters of the new genus, 339.  
 Hippelates, new species of, 388.  
 Hirst, S., on the origin and affinities of the Acari of the family Demodecidæ, with brief remarks on the morphology of the group, 400.  
 Homoptera, new, 196.  
 Hymenitis, new species of, 85.  
 Hymenoptera, new, 86, 153, 284, 349, 356, 408.  
 Hypera, new species of, 176.  
 Hypoleiria, new species of, 85.  
 Hyposcada, new species of, 82.  
 Hypsimys, characters of the new genus, 190.  
 Hyptiogaster, new species of, 403.  
 Ithomiinæ, on new species and races of, 77.  
 Kaye, W. J., on new species and races of Ithomiinæ, 77; on a new genus and species of Amatidæ, 325.  
 Klinothrips, characters of the new genus, 217.  
 Krinothrips, characters of the new genus, 220.  
 Laccoptera vigintisex-notata, note on, 318.  
 Lamb, C. G., notes on exotic Chloropidae, 329, 385.  
 Lamellaria, new species of, 142.  
 Lamprosema, new species of, 133, 252.  
 Lasiopleura, new species of, 388.  
 Lathridius, new species of, 174.  
 Lepidoptera, new, 18.  
 Leptogale, characters of the new genus, 306.  
 Leptothyra, new species of, 151.  
 Liodoryctes, new species of, 53.  
 Listroderes, new species of, 177, 179.  
 Lonchonotus, characters of the new genus, 337.  
 Lygeus, new species of, 420.  
 Lygropia, new species of, 271.  
 Mammals, new, 33, 38, 186, 193, 230, 242, 302, 307, 364, 370, 375, 426.  
 Margaronia, new species of, 272.  
 Marshall, Dr. G. A. K., on new African Curculionidæ, 1; on a new genus of Asiatic Curculionidæ, 245.  
 Maulik, S., on variation in the prothoracic spines of Dactylispa xanthopus, 70; note on Epistictia reichiana, 74; on Laccoptera vigintisex-notata, 318; on two new Indian Cassidine beetles, 322.  
 Mecistocerus, new species of, 7.

- Megachile, new species of, 159.  
 Melanella, new species of, 142.  
 Melipona, new species of, 162.  
 Melville, Dr. J. C., on marine mollusca from the Persian Gulf, &c., 137.  
 Mennis, new species of, 31.  
 Merosciniis, new species of, 333.  
 Metasiopsis, new species of, 29.  
 Microgale, new species of, 305.  
 Microspilus, new species of, 420.  
 Mimaletis, new species of, 315.  
 Minolia, new species of, 153.  
 Mitra, new species of, 141.  
 Mollusca, new, 96, 137, 234, 401.  
 Motes, new species of, 362.  
 Mucronalia, new species of, 143.  
 Napeogenes, new species of, 78.  
 Neodioctria, characters of the new genus, 58.  
 Neoitamus, new species of, 64.  
 Neosaropogon, new species of, 60.  
 Nesogale, characters of the new genus, 303.  
 Nesoryctes, characters of the new genus, 307.  
 Nomia, new species of, 160, 161.  
 Nusa, new species of, 61.  
 Nyctemera, new species of, 317.  
 Odonthrips, new species of, 203.  
 Ommatius, new species of, 66.  
 Oncopeltus, new species of, 418.  
 Oscininae, notes on the subfamily, 329, 385.  
 Oscinis, new species of, 395.  
 Othroeda, new species of, 318.  
 Oxynoe, new species of, 155.  
 Paraechinus, new species of, 232.  
 Petrodromus, new species of, 364.  
 Petronievs, Dr. B., on the lower jaw of *Stereognathus ooliticus*, 67.  
 Phacoides, new species of, 156.  
 Philanthus, new species of, 361.  
 Phostria, new species of, 128.  
 Physothrips, new species of, 206.  
 Pigia, new species of, 27.  
 Pileocera, new species of, 126.  
 Pilocrocis, new species of, 125.  
 Pisania, new species of, 140.  
 Pisoraca, new species of, 25.  
 Platymycterus, characters of the new genus, 245.  
 Pocock, R. I., on the baculum of some genera of *Mustelidae*, 307; further notes on some external characters of the bears, 375; on some external characters of ruminant *Artiodactyla*, 426.  
 Podothrips, new species of, 211.  
 Pœcilasma carinatum, remarks on, 401.  
 Potamonidae, new, 234.  
 Pristaulacus, new species of, 414.  
 Prosopis, new species of, 163.  
 Protoechinus, remarks on, 40.  
 Protostigmus, characters of the new genus, 356.  
 Prout, L. B., on new *Lepidoptera*, 18; on new *Heterocera*, 312.  
 Pseudagenia, new species of, 352.  
 Pteronymia, new species of, 84.  
 Ptychophyle, new species of, 22.  
 Ptychopoda, new species of, 29.  
 Pulastya, new species of, 200.  
 Purusha, new species of, 200.  
 Pyralidae, new, 125, 252, 265.  
 Pyraustinae, notes on the subfamily, 125.  
 Rhopalum, new species of, 92.  
 Rhynchocyon, notes on, 370.  
 Rhynchota, new, 416.  
 Ricardo, Miss G., notes on *Asilidae* from Australia, 57.  
 Rissoina, new species of, 147.  
 Sabalia, new species of, 18.  
 Salvazana, new species of, 196.  
 Sameodesma, characters of the new genus, 278.  
 Scada, new species of, 83.  
 Scalpellum, on barnacles of, 96.  
 Scolioptthalmus, new species of, 331.  
 Scopiastes, new species of, 416.  
 Semæopus, new species of, 20.  
 Siphonella, new species of, 343.  
 Siphunculina, new species of, 345.  
 Sphex, new species of, 88.  
 Sphrigodes, new species of, 2.  
 Spilomena, new species of, 358.  
 Stereognathus ooliticus, on the lower jaw of, 67.  
 Stizus, new species of, 91.  
 Styloptygma, new species of, 146.  
 Sylepta, new species of, 260, 265.  
 Sylvilagus, new species of, 192.  
 Sympiezomias, new species of, 1.  
 Synclysmus, new species of, 313.  
 Tachysphex, new species of, 363.  
 Tachytes, new species of, 94.  
 Tamiscus, characters of the new genus, 33.  
 Thliptoceras, new species of, 279.  
 Thomas, O., on the squirrels hitherto

- referred to *Paraxerus*, 33; on two new tuco-tucos from Argentina, 38; on small mammals from Salta and Jujuy, 186; on the generic division of the hedgehogs, 193; on four new species of hedgehog, 230; notes on the small sand-foxes of North Africa, 242; on the arrangement of the small *Tenrecidæ*, 302; notes on *Petrodromus* and *Rhynchocyon*, 364; on a new wild dog from the Bogotá Cordillera, 370.
- Thysanoptera*, new, 201.
- Tithorea*, new species of, 78.
- Trichobius*, new species of, 424.
- Tricimba*, new species of, 393.
- Trigona*, new species of, 165.
- Triphora*, new species of, 149.
- Trypoxylon*, new species of, 363.
- Turbonilla*, new species of, 143.
- Turner, R. E., notes on *Braconidæ*, 49, 221; notes on fossorial hymenoptera, 86, 284, 349, 356, 408.
- Ulopeza*, new species of, 126.
- Vagitanus*, characters of the new genus, 196.
- Vulpes*, new species of, 244.

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# CONTENTS OF NUMBER 6.—*Ninth Series.*

	Page
XLVII. Notes on Exotic <i>Chloropidae</i> .—Part II. <i>Osciniæ</i> . By C. G. LAMB, M.A., B.Sc., Clare College, Cambridge .....	385
XLVIII. On the Origin and Affinities of the Acari of the Family <i>Demodectidae</i> , with Brief Remarks on the Morphology of the Group. By STANLEY HURST .....	400
XLIX. The Type-specimens of <i>Pacilusma carinatum</i> , Hoek (Cirri- pedia). By W. T. CALMAN, D.Sc. ....	401
L. On new Hymenoptera of the Family <i>Evanidæ</i> in the British Museum. By ROWLAND E. TURNER, F.Z.S., F.E.S. ....	408
LI. Contributions to a further Knowledge of the Rhynchotal Family <i>Lygæidæ</i> . By W. L. DISTANT .....	416
LII. Two new Diptera from Trinidad. By F. W. EDWARDS ....	424
LIII. On some External Characters of Ruminant Artiodactyla.— Part I. The <i>Cephalophinæ</i> , <i>Neotraginæ</i> , <i>Oreotraginæ</i> , and <i>Mado- quinæ</i> . By R. I. Pocock, F.R.S. ....	426

## PROCEEDINGS OF LEARNED SOCIETIES.

Geological Society .....	435
Index .....	437

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